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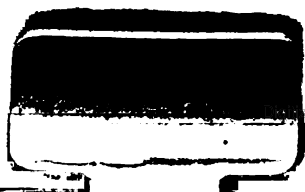
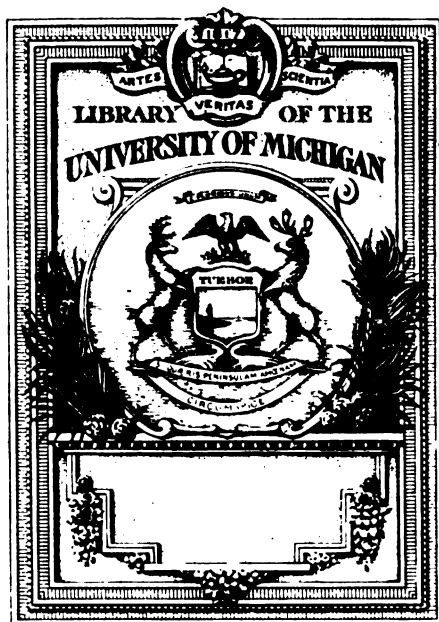
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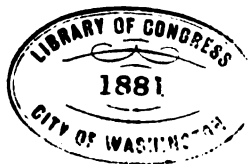
# DOCUMENTS

OF THE

## ASSEMBLY OF THE STATE OF NEW YORK.

ONE HUNDRED AND THIRD SESSION,

1880.



VOLUME VI.—Nos. 76 to 89 Inclusive.



ALBANY:

WEED, PARSONS AND COMPANY, PRINTERS.

1880.

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# STATE OF NEW YORK.

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No. 76.

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## IN ASSEMBLY,

MARCH 4, 1880.

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### RESOLUTIONS

OF THE CANAL BOARD RELATIVE TO THE RATES OF  
TOLL ON THE BLACK RIVER, ERIE, OSWEGO, CHAM-  
PLAIN, AND CAYUGA AND SENECA CANALS.

STATE OF NEW YORK, }  
CANAL DEPARTMENT. }

At a meeting of the Canal Board, held at the Canal Department on the 2d day of March, 1880, the following resolutions were adopted:

*Resolved*, That the report of the committee, to whom was referred the toll-sheet of the Black River canal for the year 1880, be adopted, and that the tolls on that canal for 1880 be the same as that of last year.

On calling the ayes and noes the resolution was adopted by the following vote:

*Ayes*—Messrs. Hoskins, Carr, Wendell, Wadsworth, Seymour and Dutcher—Total, 6.

STATE OF NEW YORK, CANAL DEPARTMENT, }  
ALBANY, March 4, 1880. }

At a meeting of the Canal Board, held at the Canal Department on the 3d day of March, the following resolutions were adopted:

*Resolved*, That the Canal Board recommend to the legislature to concur in the rates of toll on the Black River canal, as stated in the accompanying toll-sheet for the year 1880.

On calling the ayes and noes the resolution was adopted by the following vote:

*Ayes*—Messrs. Hoskins, Carr, Wadsworth, Wendell, Seymour and Dutcher—Total, 6.

[*Assem. Doc. No. 76.*]

*Resolved*, That the Canal Board recommend to the legislature to concur in the rates of toll upon the Erie, Oswego, Champlain and Cayuga and Seneca canals, as stated in the accompanying toll-sheet for the year 1880.

On calling the ayes and noes the resolution was adopted by the following vote:

*Ayes*—Messrs. Hoskins, Carr, Wadsworth, Wendell, Seymour and Dutcher—Total, 6.

### RATES OF TOLL—1880.

ESTABLISHED BY THE CANAL BOARD, ON PERSONS AND PROPERTY TRANSPORTED ON THE BLACK RIVER CANAL, TO TAKE EFFECT ON THE OPENING OF NAVIGATION.

[Toll is to be computed upon the weight ("1,000 pounds per mile") of all articles contained in the following list, unless otherwise stated opposite to the articles excepted.]

	cts.	m.	fr.
Boats .....			Free.

#### THE FOREST.

Fur and peltry .....			Free.
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#### *Product of Wood.*

Ashes, pot and pearl.....	0	0	5
Ashes, leached.....			Free.
Lath, per M per mile.....	0	0	1
Lath, per 1,000 pounds per mile.....	0	3	0
Staves, heading, etc.....	0	3	0
Shingles, per M per mile.....	0	0	1½
Shingles, per 1,000 pounds.....	0	0	5

#### *Wood for Fuel.*

Slab wood, per cord.....	0	1	0
Cord wood, per cord.....	0	2	0

Lumber No. 1.\*— By weight, per 1,000 pounds per mile :

White pine, white-wood, bass-wood, cedar, boards, planks, scantling, and all sidings and other sawed stuff, less than one inch thick (except such as is enumerated in <i>Lumber No. 3</i> ).....	0	3	0
Oak, hickory, beech, sycamore, black walnut, butternut, maple, ash, elm, fir, tamarack, yew and cherry.....	0	3	0
Hemlock and spruce .....	0	3	0

Lumber No. 2.\*— By measurement, per 1,000 feet per mile :

Boards, planks, scantling, railroad ties, pickets for fences, and sawed timber, siding and other sawed stuff, less than one inch thick, reduced to inch measure (except such as is enumerated in *Lumber No. 3*) ;

and all kinds of red cedar, cedar posts, estimated that a cord, after deducting for openings, will contain 1,000 feet.....

ots. m. fr..

0 4 0

Hemlock and spruce, per 1,000 feet per mile ..... 0 4 0

Lumber No. 3.\*— By weight, per 1,000 pounds per mile:

Hoop poles, hand spikes, rowing oars, broom handles, spokes, hubs, treenails, fellies, boat and ship knees, plane stocks, pickets for fences, railroad ties, last blocks, stuff (manufactured or partly manufactured) for boxes, chairs and bedsteads, hop poles, brush handles, brush backs, looking-glass backs, gun stocks, plow beams and plow handles.....

0 3 0

Sawed stuff for window blinds, not exceeding one-fourth of an inch in thickness.....

0 7 0

\*LUMBER shall not be cleared by measurement when carried in a boat having other articles on board paying toll by WEIGHT, but such lumber shall in all cases be also cleared by weight.

When a cargo is composed entirely of lumber, which can be cleared by weight or measure, the whole of such cargo shall be cleared by measurement or by weight, as the shipper or master may elect, and in no case shall a portion of any such cargo be cleared by measurement and the other portion by weight.

Tan bark, per cord, per mile ..... 0 5 0

Timber.\*— Squared and round, transported in rafts, per 100 cubic feet .... 1 5 0

#### AGRICULTURE.

##### *Product of Animals.*

Pork .....	Free.
Beef .....	Free.
Bacon .....	Free.
Cheese .....	Free.
Butter.....	Free.
Lard, tallow and lard oil.....	Free.
Wool .....	Free.
Hides .....	0 1 0

##### *Vegetable Food.\**

Flour .....	Free.
Wheat .....	0 0 5
Rye .....	0 0 5
Corn .....	0 1 0
Corn meal.....	0 0 5
Barley .....	0 0 5
Barley malt .....	0 0 5
Oats.....	0 0 5
Bran and ship stuffs.....	0 0 5
Peas and beans.....	0 0 5
Apples.....	0 0 5
Potatoes .....	0 3 0

\* In the measurement of timber, bark adhering to the wood and refuse stuff are to be estimated as forming part of the timber, and to be rated accordingly.



*All Other Agricultural Products.*

	cts.	m.	fr.
Dried fruit.....			Free.
Cotton .....			Free.
Unmanufactured tobacco .....			Free.
Hemp .....			Free.
Clover and grass seed.....			Free.
Flax seed.....			Free.
Hops .....			Free.

**MANUFACTURES.**

Domestic spirits.....			Free.
Oil meal and cake.....			Free.
Leather .....	0	1	0
Furniture .....	0	0	
Bar and pig lead.....			Free. 5
Pig iron.....	0	0	5
Bloom and bar iron.....	0	0	5
Castings and iron ware .....	0	0	5
Domestic woollens.....			Free.
Domestic cottons .....			Free.
Domestic salt.....	0	0	5
Foreign salt.. ..	0	2	5

**MERCHANDISE.**

Sugar .....	0	0	5
Molasses .....	0	0	5
Coffee .....			Free.
Nails, spikes and horse shoes .....	0	0	5
Iron and steel.....	0	0	5
Railroad iron .....	0	0	5
Flint enamel, crockery, glassware.....	0	0	5
All other merchandise.....	0	0	5

*Other Articles.*

Live cattle, hogs and sheep.....			Free.
Stone, lime and clay .....	0	0	5
Gypsum .....	0	0	5
Anthracite coal.....	0	0	1½
Bituminous coal.....	0	0	1½
Copper ore.....	0	0	5
Iron ore.....	0	0	2½
Petroleum or earth oil, crude and refined .....	0	0	2½
Articles not specified .....	0	0	5

## RATES OF TOLL — 1880.

ESTABLISHED BY THE CANAL BOARD, ON PERSONS AND PROPERTY TRANSPORTED ON THE ERIE, CHAMPLAIN, OSWEGO, AND THE CAYUGA AND SENECA CANALS, TO TAKE EFFECT ON THE OPENING OF NAVIGATION.

[Toll is to be computed upon the weight ("1,000 pounds per mile") of all articles contained in the following list, unless otherwise stated, opposite to the articles excepted.]

	TOWARDS TIDE.			FROM TIDE.		
	cts.	m.	fr.	cts.	m.	fr.
Boats .....	Free.			Free.		

## THE FOREST.

Fur and peltry .....	Free.			Free.		
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*Product of Wood.*

Ashes, pot and pearl.....	0	0	5	0	0	2½
Ashes, leached.....	Free.			Free.		
Lath, per M per mile.....	0	0	1	0	0	1
Lath, per 1,000 pounds per mile.....	0	0	7½	0	0	7½
Staves, heading, etc .....	0	0	5	0	0	5
Shingles, per M per mile.....	0	0	1½	0	0	1½
Shingles, per 1,000 pounds .....	0	0	5	0	0	5

*Wood for Fuel.*

Slab wood, per cord.....	0	1	0	0	1	0
Cord wood, per cord.....	0	2	0	0	2	0

Lumber No. 1.\* By weight, per 1,000 pounds per mile:

White pine, white-wood, bass-wood, cedar, boards, plunks, scantling, and all sidings and other sawed stuff, less than one inch thick (except such as is enumerated in <i>Lumber No. 3</i> ).....	0	0	7½	0	0	7½
Oak, hickory, beech, sycamore, black walnut, butternut, maple, ash, elm, fir, tamarack, yew and cherry.....	0	0	5	0	0	5
Hemlock and spruce .....	0	0	3½	0	0	3½

Lumber No. 2.\*— By measurement, per 1,000 feet per mile:

Boards, planks, scantling, railroad ties, pickets for fences, and sawed timber, siding and other sawed stuff, less than one inch thick, reduced to inch measure (except such as is enumerated in <i>Lumber No. 3</i> ); and all kinds of red cedar, cedar posts, estimated that a cord, after deducting for openings, will contain 1,000 feet, Hemlock and spruce, per 1,000 feet per mile.....	0	1	5	0	1	5
	0	1	0	0	1	0

TOWARDS TIDE FROM TIDE.  
cta. m. fr. cta. m. fr.

Lumber No. 3.\*— By weight, per 1,000 pounds per mile:

Hoop poles, hand spikes, rowing oars, broom handles, spokes, hubs, treenails, fellies, boat and ship knees, plane stocks, pickets for fences, railroad ties, last blocks, stuff (manufactured or partly manufactured) for boxes, chairs and bedsteads, hop poles, brush handles, brush backs, looking-glass backs, gun stocks, plow beams and plow handles.....

0 0 7½ 0 0 7½

Sawed stuff for window blinds, not exceeding one-fourth of an inch in thickness,

0 2 0 0 2 0

\* LUMBER shall not be cleared by measurement when carried in a boat having other articles on board paying toll by WEIGHT, but such lumber shall in all cases be also cleared by weight

When a cargo is composed entirely of lumber, which can be cleared by weight or measure, the whole of such cargo shall be cleared by measurement or by weight, as the shipper or master may elect, and in no case shall a portion of any such cargo be cleared by measurement and the other portion by weight.

Timber.\*—Squared and round, transported in rafts, per 100 cubic feet.....

0 5 0 0 5 0

#### AGRICULTURE.

##### *Product of Animals.*

Pork .....  
Beef .....  
Bacon .....  
Cheese.....  
Butter.....  
Lard, tallow and lard oil.....  
Wool.....  
Hides.....

Free. Free.  
Free. Free.  
Free. Free.  
Free. Free.  
Free. Free.  
Free. Free.  
0 0 5 0 0 2½

##### *Vegetable Food.*

Flour .....  
Wheat.....  
Rye.....  
Corn.....  
Corn meal.....  
Barley.....  
Barley malt.....  
Oats.....  
Bran and ship stuffs.....  
Peas and beans.....  
Apples.....  
Potatoes.....  
Dried fruit.....

Free. Free.  
0 0 5 0 0 2½  
0 0 5 0 0 2½  
0 0 5 0 0 2½  
Free. Free.  
0 0 5 0 0 2½  
0 0 5 0 0 2½  
0 0 5 0 0 2½  
0 0 5 0 0 2½  
0 0 5 0 0 2½  
0 0 5 0 0 2½  
Free. Free.

\* In the measurement of timber, bark adhering to the wood and refuse stuff are to be estimated as forming part of the timber, and to be rated accordingly.

TOWARDS TIDE. FROM TIDE.  
cts. m. fr. cts. m. fr.

*All Other Agricultural Products.*

Cotton.....	Free.	Free.
Unmanufactured tobacco.....	Free.	Free.
Hemp.....	Free.	Free.
Clover and grass seed.....	Free.	Free.
Flax seed.....	Free.	Free.
Hops.....	Free.	Free.

## MANUFACTURES.

Domestic spirits.....	Free.	Free.
Oil meal and cake.....	Free.	Free.
Leather.....	Free.	Free.
Furniture.....	0 0 5	0 0 2½
Bar and pig lead.....	Free.	Free.
Pig iron.....	0 0 5	0 0 2½
Bloom and bar iron.....	0 0 5	0 0 2½
Castings and iron ware.....	0 0 5	0 0 2½
Domestic woolens.....	Free.	Free.
Domestic cottons.....	Free.	Free.
Domestic salt.....	0 0 5	0 0 5
Foreign salt.....	0 1 0	0 1 0

## MERCHANDISE.

Sugar.....	0 0 5	0 0 2½
Molasses.....	0 0 5	0 0 2½
Coffee.....	Free.	Free.
Nails, spikes and horse shoes.....	0 0 5	0 0 2½
Iron and steel.....	0 0 5	0 0 2½
Railroad iron.....	0 0 5	0 0 2½
Flint enamel, crockery and glassware.....	0 0 5	0 0 2½
All other merchandise.....	0 0 5	0 0 2½

*Other Articles.*

Live cattle, hogs and sheep.....	Free.	Free.
Stone, lime and clay.....	0 0 5	0 0 2½
Gypsum.....	0 0 5	0 0 2½
Anthracite coal.....	0 0 1½	0 0 1½
Bituminous coal.....	0 0 1½	0 0 1½
Copper ore.....	0 0 5	0 0 2½
Iron ore.....	0 0 2½	0 0 2½
Petroleum or earth oil, crude and refined.....	0 0 2½	0 0 2½
Articles not specified.....	0 0 5	0 0 2½

STATE OF NEW YORK, }  
CANAL DEPARTMENT. }

I certify that I have compared the foregoing resolutions and toll-sheets with the original minutes of the Canal Board, on file in this department, and that the same are true copies of the originals as adopted by the Canal Board upon the days of which they bear date.

In witness whereof, I have hereunto set my hand and affixed  
[L. s.] my official seal, this 4th day of March, in the year 1880.

GEORGE W. SCHUYLER,

*Auditor.*



STATE OF NEW YORK.

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No. 77.

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IN ASSEMBLY,

MARCH 5, 1880.

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ANNUAL REPORT  
OF THE SUPERINTENDENT OF THE ADIRONDACK  
SURVEY.

Hon. GEORGE H. SHARPE,

*Speaker of the Assembly:*

SIR — Pursuant to chapter 370 of the Laws of 1878, I have the honor to submit the accompanying printed report on the progress of the Adirondack Survey to the year 1880.

Very respectfully yours,

VERPLANCK COLVIN,

*Superintendent of Survey.*

[Assem. Doc. No. 77.]

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S. N. Y.

## ADIRONDACK SURVEY.

### ACCOUNT CURRENT, 1879-80.

*Dr.*

To balance.....	\$1,779 68
To regular appropriation as provided by Laws of 1878, and made by chapter 148 of the Laws of 1879.....	10,000 00
	<u>\$11,779 68</u>

*Cr.*

By abstract of expenditures rendered to the comptroller August 31st, 1879, with thirty-one vouchers and bills of items .....	\$3,071 14
By abstract of expenditures rendered to the comptroller December 30th, 1879, with thirty vouchers and bills of items .....	5,384 77
By abstract of expenditures rendered to the comptroller January 14th, 1880, with thirty-five vouchers with bills of items.....	1,975 12
By abstract of expenditures rendered to the comptroller February 9th, 1880, with thirty-eight vouchers with bill of items.....	1,646 32
By abstract of expenditures rendered to the comptroller March 1st, 1880, with sixteen vouchers and bill of items .....	1,205 48
	<u>\$13,282 83</u>
Total cash received from the State, 1879-1880.....	\$11,779 68
Total expenditures, 1879-1880.....	13,282 83
	<u>Balance due superintendent..... \$1,503 15</u>

In addition to the expenditures above mentioned, is the compensation due the engineers and surveyors on the completion of their office work and maps; to be paid from the continued appropriation provided by the Laws of 1878.

ALBANY, *March 1, 1880.*

The above is an accurate statement of the accounts of the Adirondack Survey to the present date.

VERPLANCK COLVIN,  
*Superintendent of Survey.*

## R E P O R T.

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*To the Honorable the Legislature of the State of New York :*

In accordance with law, I have the honor to submit, accompanied with maps and illustrations, the following report :

The field season just closed has been marked by complete success in all of the important departments of work, though the survey has been conducted under unusual difficulties, no portion of the regular appropriation being available until the first of October last, near the close of the field season. This, taken in connection with the contracts already made for special work, and the necessity of obtaining the maximum value of the labor of each party while it remained in the field, has rendered the expenditures necessarily somewhat larger than usual, during the same period of time.

I take pleasure in here acknowledging the faithfulness and devotion of all the assistants, aids and employees of the survey, who, aware that their salaries could not be paid until fall, nevertheless, one and all, worked steadily on in their several employments, obeying, implicitly, every direction, and by their perfect discipline, subordination and earnestness in the work, secured the required results.

### ORGANIZATION.

The organization of the survey has continued nearly the same as during the last season, with the exception of a few changes among the aids and subordinate employees.

The personnel of the survey during 1879 was as follows :

*Primary Triangulation, Astronomical Observations* and special topographical work, by the SUPERINTENDENT personally.

*Division of Levels.* — M. Blake in charge, one aid, with guides, axmen, etc.

*Signal Division.* — The work of this division during the season was conducted by parties in charge of the *Constructors of Signals* acting under the immediate orders of the Superintendent. The tertiary signals on two of the Divisions of local surveys were built by the survey parties engaged on those Divisions.



## SUBORDINATE AND LOCAL SURVEYS.

*Southwestern Division.*—S. H. Snell, C. E., in charge, S. S. Snell, H. Hubbard, Aids; besides guides, teamsters, etc., and the assistance of the Surveyor and aid from the mid-western Division, during the interval from July 20th to August 22d.

*Mid. Western Division.*—F. Tweedy, C. E., in charge, F. H. Foster, aid, besides guides, packmen, etc.

*North Western Division.*—S. J. Farnsworth, C. E., in charge, S. B. Crandall, assistant; G. M. Sperry, Henry Munson, Edwin A. Meritt, Jr., Herbert Hepburn, aids; with cook, camp keeper, teamster, etc.

*South Eastern Division.*—D. M. Arnold, C. E., in charge, G. L. Locke, assistant; C. D. Burris, topographer; B. M. Gallien, J. Braman, R. W. Arthur, G. A. Davis, M. J. Wilcox, aids; besides cook and teamster.

*Mid. Eastern Division.*—W. H. Case, C. E., in charge, (no work undertaken this season).

*North Eastern Division.*—H. K. Averill, C. E., in charge; (work limited to completion of maps and computations of field work of preceding season.)

To avoid expense the *Photographic Division* was discontinued.

The *Meteorological* and rain fall stations were as follows:

Pottersville, Warren Co.—L. R. Locke, Observer.

Keene Valley, Essex Co.—O. S. Phelps, Observer.

Plattsburg, Clinton Co.—Geo. W. Pries, Observer.

The observations at Plattsburg were secured at small expense, being taken at the Plattsburg Barracks by an experienced and careful observer.

## FIELD WORK, 1879.

Near the close of May I made an inspection of the state of map-work, etc., in the offices of the assistants at Plattsburgh and Ticonderoga, and examined the condition of the instruments at the meteorological stations. A conference was also had with the Division Surveyors of all of the eastern divisions and arrangements for work made. The signal parties were also organized and sent out and a variety of preparations made for the field.

The regular field work of the season was commenced on the Mid-western Division on June 21st by Assistant Tweedy and Aid. He was directed to first run lines of check levels along the hypsometric base-line, through the counties of Lewis, Herkimer and Hamilton, and to measure and remeasure between such of the bench-marks as had not as yet been checked, until permanent results had been obtained. This accomplished he was to extend the levels eastward to Raquette and

Blue Mt. Lakes, establishing numerous stone bench-marks in that region as a basis in the plane-table leveling or contouring. This work, throughout, was to be co-ordinate with the usual topographical sketching of ground on the line survey work, and the assistant was directed to hold himself in readiness to join and assist the party of the Southwestern Division when required.

All the details of this work were successfully carried out between June twenty-first and November first. The work of this division affords permanent datums for the engineering works to be undertaken in this section, furnishing the difference of level of lakes, the value of water-sheds and lake basins for reservoir purposes, together with the data essential for the altitude measurements for accurate mapping. About 100 miles of levels and check-lines were run with precision, with level and graduated rod, on this division alone.

On July twenty-first, the assistant in charge of the southwestern division, having completed his arrangements, resumed the work of retracing, restoring and monumenting the lines of the Totten and Crossfield purchase, and the John Brown tract, in the area to the southward of Beaver river.

This work was carefully carried out in accordance with my instructions, and extended over the mountain chains in the face of every difficulty, reaching the seventh lake of the Fulton chain, at 138,000 feet from the initial monument. The whole length of this base-line had been most carefully measured with steel ribbon, with spring balance attachments, etc., and the precise horizontal measurements showed the most startling errors in the ancient surveys in this section. From corner to corner of one township, along this line, the precise measurement showed an error in the ancient survey, in a distance of less than six miles, of over 1,000 feet.

Important discoveries of lakes were made and numerous surveys of waters joining upon the base-line, which in this section of the dense forest (so impracticable for triangulation), here served the most important purposes in the topographical work. The work of this division was carried through promptly and successfully within the limits of expenditures which I had prescribed. In addition to the restoration of this land line, which a century of neglect had suffered in many places to decay and disappear, and permanent marking of the corners with stone monuments — our line, when connected with the triangulation, will locate the precise position of all the townships lying along it, and accurately show upon the maps the maze of hills, valleys, streams and passes which govern the future improvement of the country.

A series of elegant maps show the results of the work on this Division.

While this work was in progress, and the assistants on the

other divisions were busily engaged in preparing for the field, I found the opportunity to resume the triangulation occupying seven important stations during the month of July, as hereafter described in the narrative in the appendix to this report.

This portion of the work was hardly accomplished before dispatches announcing the readiness of the assistants to proceed with work on the other divisions were received.

The work of the North-Western division was commenced at Potsdam, St. Lawrence county, August 4th, an astronomical station and temporary observatory having been established, the central monument of which served, as the initial point in the chained base-lines for the survey of the Raquette river, and the connection of the land lines of the Macomb's purchase, with the triangulation.

The necessary *preliminary* astronomical work at Potsdam was completed August 8th, the river survey party having already extended their lines several miles southward up the stream. This party was provided with new and superior instruments; the engineers transit being of the latest construction, and having a solar compass attachment, by which the direction of the meridian could be ascertained at any time during a favorable day. The "chain measurement" of the base-line was made with a standard steel tape, with spring balance and levels at the handles, and thermometer which was read hourly as the measurements proceeded — this correction becoming important in such long lines measured — some in midsummer and some amid ice and snow.

The total number of stations occupied along the base-lines of the Raquette River Survey was 382; each station being marked by permanent stone with drill hole in the rock and number. Important monuments were also set at various corners of townships in this division during the season, the centers being marked as usual on this survey by brightly polished nickel plated bolts of copper, with inscriptions showing the townships marked.

A mass of topographical map work was completed in the field, and will be shown on the maps of the Division. The base-lines and topography are connected with the triangulation by twelve (12) signals placed at prominent stations, as detailed in the narrative in the appendix.

On the South-eastern Division the most important of river surveys so far undertaken was made in the complete topographical survey of the valley of the Upper Hudson from Glens Falls through Saratoga and Warren counties to my astronomical station of 1877 on the line of Essex county near the settlement of "North River." This important survey fills the gap or interval in the maps between the State canal surveys at Glens Falls and the topographical work in the interior, and shows for the first time the true position of this portion of our noble river.

The base-lines of the upper Hudson survey were run with the same scrupulous accuracy which marks the work of my other survey parties, a delicate steel chain with levels, thermometer, etc., being used in the measurements between the monuments and the topographical work being carefully executed with plane table, the results being shown on eight elegant plane table sheets, besides a mass of topographical detail work on the line surveys. One of the most gratifying results of this work was the discovery and restoration of the initial point of the great Dartmouth, Jessup and Totten and Crossfield purchases, on the banks of the Hudson river. This initial point location, the "Landing House" tree of Ebenezer Jessup in 1772, was discovered and fully identified as hereafter detailed in the narrative. The very interesting historical associations and information collected will be valuable to students of the period of the Revolutionary war with Britain. The location of the initial point is now preserved by a massive stone monument covered by a signal, the latitude and longitude of which will preserve the position of this important monument for all time. The number of permanent stations in stone on this survey exceeds 438, without counting off-set lines or signals. The survey is connected with the triangulation by fifteen signal stations, prominent among which stand Crain's mountain, Potash Kettle mountain, Antonio mountain, Sugar Loaf mountain, Pierrepont hill, Deer-leap hill and Wolf hill, etc., etc. The work was frequently oriented along its extent by observations of elongations of circumpolar stars, and on all these transit lines, the direct measurements were always checked and tested by nice stadium or micrometric measurements, back and fore from stations. The work of this division was commenced August tenth, and was not completed before November eighth. It was executed under my constant orders and directions.

The leveling work was, during the season, extended to numerous new stations, all of the divisions of this work being conducted under the general direction of the assistant in charge, as hereafter detailed in the abstract of his report in the appendix. In the direct and check lines, more than 1,000 stations here occupied, affording the most important results.

In the triangulation, more than thirty-seven (37) first-class stations were made, the signal on Black mountain, near Lake George, being of exceptional construction, and built of wrought iron, rising to a height of about thirty feet above the peak. This important station was constructed for the purpose of connecting this survey with the primary lines of the United States coast survey.

Owing to the intense smoke, caused by forest fires, and a heated atmosphere, it was not possible to use all of the thirty-

seven signals constructed, especially those in the far interior, built in advance of the regular work. Twenty-eight stations were, however, occupied, though in several cases the measurements could not all be completed, on account of the smoke, which at times was so dense as to prevent vision of points less than twelve hundred feet distant. This work, however, will be easily completed at the beginning of the coming season.

Thus, in the face of numerous obstacles, results have been obtained which were even greater than anticipated. The toil encountered and discoveries made can, however, be but briefly shown in these annual reports, which must be made more brief, in order to save that time from publication which I find is necessary for field work.

The profiles of levels are valuable, showing exact sections of the region. The illustrations, maps, photographs, etc., are twenty-five in number and with the several memoranda relative to phenomena and scientific notes will be found in the appendix.

All of which is respectfully submitted,

VERPLANCK COLVIN,

*Superintendent of Survey.*

# STATE OF NEW YORK.

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No. 78.

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## IN ASSEMBLY,

MARCH 8, 1880. •

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### REPORT

#### OF COMMITTEE OF PRIVILEGES AND ELECTIONS IN CONTESTED SEAT CASE OF LIDDLE VS. HYNES.

*To the Honorable, the Assembly of the State of New York:*

Your committee on privileges and elections, to which was referred the petition of Thomas Liddle, claiming the seat occupied by Joseph Hynes, from the fourth district of Albany county, respectfully report: That they have fully investigated the same, have sworn and examined over three hundred witnesses, and have received and examined the returns as made from said Assembly District, outside of the fifth election district of the town of Watervliet, as well as from said fifth district, from which it appears that the petitioner, Thomas Liddle, received, outside of said fifth district, three thousand three hundred and seventy-four votes, and Joseph Hynes, the sitting member, received, in the same portion of said Assembly District, three thousand one hundred and fifty-six votes, leaving a majority for said Liddle, of two hundred and eighteen votes.

That this portion of the returns was undisputed, the only contest or dispute being as to the said fifth district of the town of Watervliet.

That the aggregate vote of that district for member of Assembly, as given by the returns of the Inspectors for that district, was seven hundred and forty-four, divided as follows:

For Joseph Hynes.....	556
For Thomas Liddle.....	181
For Thos. B. Boyd.....	7
	<hr/>
	744

Or a majority for Mr. Hynes over Mr. Liddle, of three hundred and seventy-five, and which, if correct, elected said Hynes by a majority of one hundred and fifty-seven.

Your committee respectfully further report: that it was clearly proved before us, that there were at least two hundred and eighty-three electors of the fifth district of said town of Watervliet, who cast their ballots for the said Thomas Liddle, at said poll, at the last election, which, in the judgment of your committee, impeaches the returns from that district, and renders it necessary, under the rules of law, to object or throw out the said returns, which would leave the said Liddle elected by a majority of two hundred and eighteen.

Your committee, although having no doubt of their right and power, under the rules of law, to allow to said Liddle the two hundred and eighty-three votes proved to have been cast for him at said poll, thus materially increasing his majority, have deemed it unnecessary.

Your committee further shows, that without throwing out such returns from said district entire, but allowing to said Liddle the number of votes thus proved to have been cast for him, the result would be as follows:

Whole number of votes for both candidates .....	737
For Joseph Hynes.....	454
For Thomas Liddle.....	283
	<hr/> 737

Or a majority in that district for Mr. Hynes, of one hundred and seventy one, which, deducted from the majority for Mr. Liddle, outside of this district, of two hundred and eighteen, would elect Mr. Liddle by a majority of forty-seven.

Your committee further report that in their opinion the Inspectors of said district and the clerks, or a portion of them, willfully and designedly falsified the actual vote cast in said district, either by a false count, or in announcing the result, in that they allowed to said Hynes a pile of ballots of eighty, which belonged to, or should have been allowed to, the said Liddle, and when their attention was called to it, persisted in the claim that they belonged to said Hynes, and almost immediately swept the ballots in the box, thus preventing a discovery and correction of their error or crime.

Your committee further report, that this fraud upon the ballot was the better enabled to be perpetrated from the fact that two of the Inspectors belonged to the same political party with Mr. Hynes, and both clerks also until about the time the canvass began, and then, at the suggestion of some person, the Republican Inspector, being a one-armed man, was induced to leave, and another nominal Republican, although a partisan of Mr. Hynes, voting and working for him, put in his place, and because the Inspectors did not each of them count all the ballots, and the clerks did not see the count, and permitted one of their number to call off to the clerks the number of ballots in each pile, for each of the candidates, and an understanding between him and one or both of the clerks, could change the actual vote double the number of any pile, without much fear of detection.

Your committee, therefore, suggests that further safeguards should be thrown around the counting of the ballots by the Inspectors, either as provided by the bill now before the Legislature, or in some other

way, or the elections will be a mere mockery, when in the hands of incompetent or dishonest Inspectors and Clerks.

Your committee therefore find and report, that the said Thomas Liddle was duly elected Member of Assembly from the fourth Assembly District of Albany county, and should have received the certificate of election instead of Joseph Hynes, and recommend the adoption of the following resolution.

*Resolved*, That Thomas Liddle was, at the last general election, duly elected to the Assembly, from the fourth Assembly District of Albany county, which seat is now held by Joseph Hynes, and that the said Thomas Liddle is hereby awarded the same.

All which is respectfully submitted.

Dated *March* 8, 1880.

DAVID W. TRAVIS,  
W. H. STEELE,  
H. J. HURD,  
C. H. DUELL,  
JOHN WARNER,  
PETER D. LEFEVER.





# STATE OF NEW YORK.

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No. 79.

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## IN ASSEMBLY,

MARCH 8, 1880.

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### COMMUNICATION

FROM THE ATTORNEY-GENERAL IN ANSWER TO A RESOLUTION OF THE ASSEMBLY, MARCH 5, 1880.

STATE OF NEW YORK,  
OFFICE OF THE ATTORNEY-GENERAL, }  
ALBANY, March 8, 1880. }

*To the Honorable the Assembly of the State of New York:*

In reply to the resolution adopted by your honorable body on March 5th inst., in the following words: \* \* \*

*“Resolved,* That the attorney-general be requested to inform this house by what authority outside counsel has been engaged to represent him before the Dannemora investigation committee, and whether such counsel has received or is to receive any pay for services so rendered out of the State treasury.”

I have the honor to report that the authority referred to is to be found in the following resolution, to wit:

*“Resolved,* That the attorney-general be requested to attend the sessions of the special committee appointed by this house to investigate the disposition made of the Plattsburgh and Dannemora railroad, as counsel for the people in that investigation, and in case of his inability to attend by reason of his public duties, that he have the power, and he is hereby requested to assign competent counsel to represent him before such committee.”

Adopted by your honorable body February 17th, 1880.

It is to be assumed that the assembly having authorized the employment of counsel will provide for his proper compensation.

[ All of which is respectfully submitted.

HAMILTON WARD, *Attorney-General.*

[Assem. Doc. No. 79.]



STATE OF NEW YORK.

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No. 80.

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IN ASSEMBLY,

MARCH 9, 1880.

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MEMORIAL AND RESOLUTION

OF THE GENERAL ASSEMBLY OF THE STATE OF CONNECTICUT, RELATING TO THE LAW REGULATING HELL GATE PILOTAGE.

STATE OF NEW YORK:

EXECUTIVE CHAMBER, }  
ALBANY, *March 9, 1880.* }

*To the Legislature :*

A certified copy of a Memorial and Resolution of the General Assembly of the State of Connecticut, passed March 5, 1880, relating to the law of this State regulating Hell Gate Pilotage, is herewith respectfully transmitted.

ALONZO B. CORNELL.

[Assem. Doc. No. 80.]

1



# MEMORIAL.

## STATE OF CONNECTICUT:

OFFICE OF SECRETARY OF STATE. }  
GENERAL ASSEMBLY, }  
*January Session, A. D. 1880.* }

*To the Honorable Legislature of the State of New York, Greeting :*

The General Assembly of Connecticut would respectfully call the attention of your honorable body to certain provisions of the statutes of the State of New York; the operation of which greatly aggrieves and unjustly burdens a worthy and industrious class of citizens of Connecticut, to wit :

Masters and owners of vessels engaged in the coastwise trade. The law referred to is comprised in section 26 of chapter 16, title 3, part 1, volume 2, of the Revised Statutes of New York, and is as follows :

“Any of said Hell Gate pilots, who shall first tender his services, may demand and receive from the master, owner or consignee of any vessel of the burden of one hundred tons and upwards, navigating the said channel of Hell Gate, to whom he shall tender his services as a pilot, and by whom the same shall have been refused, whether outward or inward bound, one-half pilotage for every foot of water such vessel may draw, which one-half pilotage shall be the one-half of the rates of the compensation established by the first section of this act.” (See § 25.)

It will be seen that under the provisions of the above section, the master, owner or consignee of a coasting vessel passing through Hell Gate is compelled to pay half-pilotage fees upon being spoken by a pilot, although his services be not accepted nor required. We are moved to ask of your honorable body the repeal of the foregoing law, and to submit the following considerations in furtherance of our request :

*First.* Many of the coastwise vessels of this State are engaged in traffic with the city of New York and its immediate vicinity, necessarily passing through Hell Gate with great frequency, and their masters are so generally familiar with the channel that they rarely need or accept the services of a pilot.

*Second.* Many of our vessels also make coasting trips to Philadelphia, Baltimore, Norfolk and southern ports, not touching at New York city. Their masters prefer the passage through the sound and

Hell Gate as shorter and safer, but under this law they also are compelled to pay half-pilotage each way. The existence and enforcement of the statute referred to tends (through the natural desire of the masters and owners to avoid the payment of an unjust demand) to drive vessels to the outside course, with its possible dangers of heavy weather and consequent risk to life and property.

*Third.* The payment of half-pilotage fees on every one of the frequent trips made by our vessels constitutes in the aggregate a most serious burden, which the masters and owners can ill afford to bear, and under which they bitterly complain.

*Fourth.* Owing to the large amount of traffic through Hell Gate, very few vessels are now navigated through under sail, but nearly all are towed by tugs, making thus a safer and more expeditious passage. It hardly need be suggested that under such circumstances a pilot on each vessel in a *tow* is as utterly useless as would be a headlight on each car of a freight train, and yet, under this *law* each consecutive vessel is compelled to pay half fees to any pilot who rows alongside and, as the tow passes, makes his consecutive offers of undesired and unaccepted service. Barges in tow are exempt from this charge, and surely sailing vessels in the same situation should have like immunity.

*Fifth.* The law complained of tends in a measure to the repression of commercial traffic, and is a hindrance to the increase of an important branch of our merchant marine. It is in the nature of an unjust tax upon every dollar invested in an interest of the country that should be fostered rather than discouraged.

*Sixth.* It is in violation of the spirit, if not the letter, of the Constitution of the United States, in which it is provided (article 1, § 9), that "no preference shall be given by any regulation of commerce or revenue to the ports of one State over those of another, nor shall vessels bound to or from one State be obliged to enter, clear, or pay duties in another," and further (art. 1, § 10), "No State shall without the consent of Congress lay any duty of tonnage."

And finally, the law is on its face grievously unjust in that it demands payment for services that are not requested, are not needed, and are not rendered.

It compels the payment of money without a pretense of value received. It extorts from the many for the benefit of the few. It enforces a gift, even though the donor is unable to give and the donee is in no need of charity. Suppose that a law of Connecticut should be enacted reading as follows: "Any merchant of Connecticut who shall first offer to any citizen of New York entering this State ten barrels of flour at ten dollars a barrel, and which offer shall have been refused, may demand and receive from said citizen of New York *five dollars for each and every* barrel of flour so offered and refused."

And yet such an enactment would be no more unreasonable and unjust than the statute complained of.

We understand that there is now before your honorable body a bill for the repeal of the obnoxious law which is herein discussed.

The fact that by a general understanding among pilots New York vessels are exempted from the compulsory payments described will account for a possible lack of vigorous hostility to the existing statute by citizens of your own State. But in view of the considerations

herein set forth we indulge the hope and prefer the earnest request that you may find it consistent with your duty to your constituents with substantial justice, and with the comity which should prevail among States of a common Union to erase from your statutes an enactment so manifestly unjust, and which bears so hardly upon a valued industry of a sister State.

*Resolved*, That the secretary of State be and hereby is instructed to send a certified copy of the foregoing memorial to his excellency the governor of the State of New York, and request him to transmit the same at once to the legislature of that State.

Passed both houses of assembly March 5, 1880.

DAVID TORRANCE, *Secretary of State*.  
Per H. H., *Clerk*.

STATE OF CONNECTICUT, }  
*Office of Secretary of State,* } ss.:

I, David Torrance, secretary of the said State of Connecticut, and keeper of the seal thereof, and of the original record of the acts and resolves of the general assembly of said State, do hereby certify that I have compared the annexed copy of the house bill No. 181, being a memorial and resolution concerning navigation and pilotage, with the original records of the same now remaining in this office, and have found the said copy to be a correct transcript thereof and of the whole of the said original; and I further certify that the said original records are public records of the State of Connecticut now remaining in this office.

In testimony whereof, I have hereunto set my hand, and affixed the seal of said State, at Hartford, this 5th day of March, 1880.

[L. s.]

DAVID TORRANCE, *Secretary of State*.





# STATE OF NEW YORK.

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No. 81.

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## IN ASSEMBLY,

MARCH 9, 1880.

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### COMMUNICATION

FROM THE COMPTROLLER IN ANSWER TO RESOLUTION  
OF THE ASSEMBLY, PASSED FEBRUARY 27, 1880.

STATE OF NEW YORK :

COMPTROLLER'S OFFICE,  
ALBANY, *March 9, 1880.* }

*To the Speaker of the Assembly :*

I have the honor to acknowledge the receipt of a resolution adopted by the Assembly on the 27th ult., in the words following, to wit:

*"Resolved,* That the Comptroller of this State be, and he is hereby requested to report to this house, at his earliest convenience, what counties or county treasurers have retained one per cent upon the State tax, and the amount so retained by each county or treasurer, and what counties have not retained it, and the amount each county or treasurer would have been entitled to retain if it had been retained."

The accompanying statements marked "A" and "B," hereto annexed, I believe give the information desired.

Respectfully submitted,

J. W. WADSWORTH,

*Comptroller.*

[Assem. Doc. No. 81.]

1

## (A.)

STATEMENT showing the amount retained by county treasurers in 1878 and 1879, for fees on State tax exclusive of State school tax.

COUNTIES.	On tax of 1877, payable in 1878.	On tax of 1878, payable in 1879.	COUNTIES.	On tax of 1877, payable in 1878.	On tax of 1878, payable in 1879.
Albany .....	\$1,416 01	.....	Oneida.....	\$500 00	.....
Allegany .....	252 21	\$203 79	Onondaga....	500 00	\$500 00
Broome.....	298 22	.....	Ontario.....	500 00	427 47
Cattaraugus..	256 20	.....	Orange .....	500 00	.....
Cayuga.....	500 00	.....	Orleans .....	300 60	.....
Chautauqua...	495 68	403 10	Oswego.....	449 66	.....
Chemung.....	282 96	280 82	Otsego.....	869 87	.....
Chenango.....	363 28	.....	Putnam.....	164 53	129 59
Clinton .....	112 34	.....	Queens.....	500 00	500 00
Columbia.....	500 00	500 00	Rensselaer...	500 00	500 00
Cortland.....	197 62	166 80	Richmond....	38 23	2 99
Delaware.....	259 83	214 86	Rockland .....	274 47	.....
Dutchess.....	500 00	.....	Saratoga.....	384 82	.....
Erie.....	1,687 68	.....	Schenectady..	192 99	.....
Essex.....	51 95	7 90	Schoharie....	188 56	.....
Franklin .....	8 74	.....	Schuyler.....	128 81	109 69
Fulton.....	180 69	.....	Seneca.....	269 44	282 19
Genesee.....	393 90	330 52	St. Lawrence.	406 38	.....
Greene.....	199 49	165 76	Steuben.....	400 94	332 15
Hamilton.....	.....	.....	Suffolk.....	327 27	.....
Herkimer.....	283 47	.....	Sullivan.....	91 97	86 14
Jefferson.....	448 14	.....	Tioga.....	212 48	.....
Kings.....	2,000 00	.....	Tompkins....	.....	.....
Lewis.....	.....	.....	Ulster .....	395 27	.....
Livingston...	.....	.....	Warren .....	101 87	82 07
Madison.....	326 33	.....	Washington..	410 21	.....
Monroe.....	500 00	500 00	Wayne.....	442 71	.....
Montgomery..	365 43	.....	Westchester..	1,484 80	.....
New York.....	5,000 00	5,000 00	Wyoming.....	.....	.....
Niagara.....	419 18	.....	Yates.....	226 20	.....
Total .....				\$27,501 38	\$10,624 84

NOTE.—Fees to Monroe and Seneca counties credited July 7, 1879, pursuant to chapter 213, Laws of 1879. Fees allowed treasurer New York county, pursuant to chapter 723, Laws of 1872.

## (B)

STATEMENT showing the amount to which county treasurers would have been entitled in 1878 and 1879, as fees on State tax, exclusive of State school tax, but for the passage of chapter 436, Laws of 1877.

COUNTIES.	On tax of 1877, payable in 1878.	On tax of 1878, payable in 1879.	COUNTIES.	On tax of 1877, payable in 1878.	On tax of 1878, payable in 1879.
Albany .....		\$1,248 55	Oneida.....		\$500 00
Allegany.....			Onondaga.....		
Broome .....		242 99	Ontario.....		
Cattaraugus.....		232 69	Orange .....		500 00
Cayuga.....		459 85	Orleans.....		251 80
Chautauqua.....			Oswego.....		381 76
Chemung.....			Otsego.....		321 14
Chenango.....		299 28	Putnam.....		
Clinton.....		74 91	Queens.....		
Columbia.....			Rensselaer.....		
Cortland .....			Richmond.....		
Delaware.....			Rockland.....		234 86
Dutchess.....		500 00	Saratoga.....		344 90
Erie.....		1,462 69	Schenectady.....		156 71
Essex.....			Schoharie.....		151 24
Franklin.....			Schuyler.....		
Fulton.....		82 16	Seneca.....		
Genesee.....			St. Lawrence.....		306 16
Greene.....			Steuben.....		
Hamilton.....			Suffolk.....		277 09
Herkimer.....		279 90	Sullivan.....		
Jefferson.....		384 41	Tioga.....		169 07
Kings.....		2,000 00	Tompkins.....	\$252 10	218 72
Lewis.....	\$165 38	140 21	Ulster.....		343 54
Livingston.....	408 84	338 34	Warren.....		
Madison.....		281 76	Washington.....		368 22
Monroe.....			Wayne.....		383 53
Montgomery.....		284 04	Westchester.....		1,264 12
New York.....			Wyoming.....	242 63	201 77
Niagara.....		355 92	Yates.....		204 80
Total.....				\$1,068 95	\$15,245 62



# STATE OF NEW YORK.

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No. 82.

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## IN ASSEMBLY,

MARCH 9, 1880.

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### LIST OF GENERAL ORDERS.

The Speaker and Clerk, by direction of the House, selected the following bills for reference to the Sub-Committee of the Whole :

G. O.

No. 131, Int. 358, G. O. 138 — Mr. Congdon :

An act allowing husbands and wives to deed and convey, sell, transfer and assign any real or personal property one to the other directly, and to pass the same title to the property as if the parties were unmarried.

No. 132, Int. 278, G. O. 139 — Mr. Cullinan :

An act to amend section eleven hundred and seventy-six of article one of title five of the Code of Civil Procedure.

No. 140, Int. 330, G. O. 149 — Mr. Low :

An act to amend chapter five hundred and eighty-nine of the Laws of eighteen hundred and seventy-five, entitled "An act to extend the powers of the trustees of the village of Wilson, in the county of Niagara."

No. 144, Int. 284, G. O. 153 — Mr. D. A. Wells :

An act to amend section two of chapter four hundred and five of the Laws of eighteen hundred and seventy-nine, entitled "An act to amend sections two and ten of chapter two hundred and forty-eight of the Laws of eighteen hundred and seventy-eight, entitled 'An act in relation to the election of officers in certain school districts.'"

No. 146, Int. 384, G. O. 157 — Mr. Griggs :

An act to amend an act entitled "An act for the better prevention of the procurement of abortions and other like offenses, and to amend the laws relative thereto," being chapter one hundred and eighty-one of the Laws of eighteen hundred and seventy-two.

[Assem. Doc. No. 82.]

No. 147, Int. 404, G. O. 158 — Mr. Rhodes :

An act to amend chapter one hundred and twenty-one of the Laws of eighteen hundred and thirty-five, entitled "An act to incorporate the Young Men's Association."

No. 148, Int. 369, G. O. 159 — Mr. Russell :

An act to abolish the office of county auditor of Kings county.

No. 149, Int. 197, G. O. 160 — Mr. Hurd :

An act requiring certain bonds and undertakings to be recorded.

No. 150, Int. 440, G. O. 162 — Mr. Duell :

An act in relation to the jurisdiction of the district courts of the city of New York.

No. 153, Int. 243, G. O. 165 — Mr. Chickering :

An act to declare Independence river and its tributaries in Lewis and Herkimer counties a public highway.

No. 157, Int. 186, G. O. 169 — Mr. Clark :

An act to prevent the bribing and corrupting of officers of the Seneca Nation of Indians.

No. 160, Int. 164, G. O. 173 — Mr. Benedict :

An act to provide for the election of a town treasurer in the town of Gravesend, in the county of Kings, and to regulate and prescribe the duties of said officer.

No. 163, Int. 365, G. O. 176 — Mr. Parker :

An act to amend chapter thirty-four of the Session Laws of eighteen hundred and seventy-six, entitled "An act to provide for the payment of a portion or the whole of the bounty debt of the county of Greene, by issuing new bonds, passed February twenty-eighth, eighteen hundred and seventy-six."

No. 164, Int. 26, G. O. 177 — Mr. Travis :

An act in relation to the keeping open of the offices of the register, county clerk and county treasurer of the county of Westchester.

No. 166, Int. 438, G. O. 179 — Mr. Catlin :

An act to provide for the refunding of a portion of the bonded debt of the town of Westchester, in the county of Westchester, and to restrict the power of the town officers to bond the said town, except as provided in chapter one hundred and ninety-three of the Laws of eighteen hundred and seventy-seven.

No. 175, Int. 109, G. O. 190 — Mr. Travis :

An act to amend chapter five hundred and twenty of the Laws of eighteen hundred and sixty-five, entitled "An act to amend title one of chapter sixteen of the first part of the Revised Statutes, in regard to roads and bridges and the appointment of overseers of highways."

## No. 178, Int. 434, G. O. 192 — Mr. Varnum:

An act to provide for the revision, amendment and consolidation of the act entitled "An act to provide for the enrollment of the militia, for the organization of the national guard of the State of New York, and for the public defense, and entitled 'the Military Code,' and of all acts amendatory thereof and supplemental thereto, or relating to the organization and government of the militia of the State.

## No. 195, Int. 325, G. O. 212 — Mr. Husted:

An act to prevent trespassing and intrusion upon railroad cars and engines.

## No. 202, Int. 423, G. O. 219 — Mr. Hurd:

An act to amend an act entitled "An act for the incorporation of villages," passed April twentieth, eighteen hundred and seventy.

## No. 204, Int. 287, G. O. 221 — Mr. Evans:

An act to incorporate the fire department of the village of Waterloo.

## No. 205, Int. 437, G. O. 222 — Mr. Husted:

An act to amend section five, title three of chapter two hundred and ninety-one, Laws of eighteen hundred and seventy, entitled "An act for the incorporation of villages."

## No. 210, Int. 60, G. O. 227 — Mr. Fiske:

An act to amend an act entitled "An act to confer on boards of supervisors further powers of local legislation and administration, and to regulate the compensation of supervisors."

## No. 213, Int. 14, G. O. 230 — Mr. Sheridan:

An act to amend an act entitled "An act to amend chapter four hundred and sixty-seven of the Laws of eighteen hundred and sixty two, entitled 'An act to prevent the adulteration of milk and prevent the traffic in impure and unwholesome milk,'" passed May second, eighteen hundred and sixty-four.

## No. 214, Int. 446, G. O. 231 — Mr. Chickering:

An act to prevent cutting timber upon unoccupied lands in this State upon which there remains unpaid taxes.

## No. 216, Int. 439, G. O. 233 — Mr. Davis:

An act to authorize the treasurer of Steuben county to sell property for unpaid taxes.

## No. 222, Int. 179, G. O. 239 — Mr. Sharpe:

An act to legalize and confirm the action of the board of supervisors of the county of Ulster in the division of the town of Kingston, in said county, by erecting the town of Ulster therefrom and attaching a portion thereof to the town of Woodstock, in said county.

## No. 230, Int. 79, G. O. 247 — Mr. Potts:

An act to repeal chapter forty-seven of the Laws of eighteen hundred and seventy-nine, entitled "An act authorizing the reduction of



pay of certain town officers in the county of Sullivan," passed February twenty-sixth, eighteen hundred and seventy-nine.

No. 231, Int. 476, G. O. 248 — Mr. Catlin :

An act to amend chapter eighty-three of the Laws of eighteen hundred and seventy-nine, entitled "An act to dissolve the corporation known as the trustees of the town of Westchester, to abolish the office of trustee of said town, and to preserve the records of said town."

No. 232, Int. 347, G. O. 249 — Mr. Chase.

An act to authorize the appropriation of the moneys raised by the town of Otsego, in the county of Otsego, under chapter four hundred and eighty-two of the Laws of eighteen hundred and seventy-five, to pay moneys borrowed by the supervisor of said town and used to secure to said town the use of the Otsego county court-house building for town hall purposes.

No. 233, Int. 265, G. O. 250 — Mr. Bradley :

An act to amend section ninety of chapter four hundred and twenty-six of the Laws of eighteen hundred and forty-seven, entitled "An act to provide for the incorporation of villages."

No. 235, Int. 419, G. O. 252 — Mr. Sharpe :

An act to repeal chapter one hundred and seventy-six of the Laws of eighteen hundred and seventy-eight, entitled "An act to repeal chapter four hundred and sixteen of the Laws of eighteen hundred and seventy-six, entitled "An act to amend chapter four hundred and forty of the Laws of eighteen hundred and seventy-three, entitled 'An' act requiring commissioners of highways to act as inspectors of plankroads and turnpikes, so far as the same relates to Ulster county.'"

No. 236, Int. 443, G. O. 254 — Mr. Sherman :

An act to amend section eight of chapter five hundred and thirty-four of the Laws of eighteen hundred and seventy-nine, entitled "An act for the preservation of moose, wild deer, birds, fish and other game."

No. 237, Int. 415, G. O. 255 — Mr. Davis:

An act for the preservation of fish in the waters of Loon lake in the county of Steuben.

No. 244, Int. 413, G. O. 262 — Mr. Tuttle :

An act to amend section one of chapter four hundred and ninety-eight of the Laws of eighteen hundred and seventy-two, entitled "An act for the protection of livery-stable keepers and other persons keeping horses at livery or pasture."

No. 245, Int. 430, G. O. 263 — Mr. Curtis:

An act to amend chapter four hundred and fifteen of the Laws of eighteen hundred and seventy-seven, entitled "An act for the protection of dairymen, and to prevent deception in sales of butter."

No. 249, Int. 461, G. O. 267 — Mr. Hurd:

An act to amend an act entitled "An act to prevent certain abuses upon the canals of this State."

No. 250, Int. 414, G. O. 268 — Mr. Van Valkenburgh:

An act to authorize the change of course of the east branch of the Eighteen Mile creek, in the town of Hartland, in the county of Niagara, in the State of New York.

No. 253, Int. 221, G. O. 273 — Mr. Chickering:

An act to authorize the railroad commissioners of the town of Lowville, in Lewis county, to take up certain bonds which under chapter fourteen, section four of Laws of eighteen hundred and seventy-two, may be taken up, and to issue others in place of said bonds at a lower rate of interest.

No. 254, Int. 408, G. O. 274 — Mr. Griggs:

An act to amend chapter four hundred and fifty-six of the Laws of eighteen hundred and seventy-nine, entitled "An act to prevent the deposit of mud, earth, soil, ashes, or refuse in the North or Hudson river, and to prevent the filling up the navigable waters of said river, and to preserve the navigation thereof," passed May twentieth, eighteen hundred and seventy-six.

No. 255, Int., 381, G. O. 275 — Mr. Husted:

An act to enable the Alanson Methodist Episcopal Church of the city of New York to transfer and convey certain real property.

No. 256, Int. 246, G. O. 276 — Mr. Duguid:

An act to incorporate the National Tent of the National Order of Rechabites.

No. 258, Int. 379, G. O. 278 — Mr. Duguid:

An act to amend an act entitled "An act to incorporate the Domestic and Foreign Missionary Society of the Protestant Episcopal Church of the United States of America," passed May thirteen, eighteen hundred and forty-six.

No. 260, Int. 342, G. O. 280 — Mr. Wiley:

An act to incorporate the Grand Lodge Knights of Pythias of the State of New York.

No. 265, Int. 377, G. O. 286 — Mr. Cullinan:

An act to repeal section two of chapter one hundred and sixty-nine of the Laws of eighteen hundred and seventy-nine, entitled "An act authorizing and directing the county clerk of Oswego county to sign the certificate of certain records now recorded and filed in the Oswego county clerk's office."

No. 270, Int. 445, G. O. 292 — Mr. Clowes:

An act to change the present number of overseers of the poor of the town of Hempstead, Queens county, from three to one.

No. 271, Int. 520, G. O. 293 — Mr. Travis :

An act to amend chapter four hundred and seventy-six of the Laws of eighteen hundred and sixty-nine, entitled "An act to establish the office of receiver of taxes in the town of New Rochelle, in the county of Westchester."

No. 273, Int. 512, G. O. 295 — Mr. Brennan :

An act to amend an act entitled "An act to establish a board of education in and for the village school district of the town of Malone, in the county of Franklin, and for other purposes," being chapter seven of the Laws of eighteen hundred and sixty-seven.

No. 277, Int. 584, G. O. 300 — Mr. Brennan :

An act conferring additional powers upon the board of supervisors of the county of Franklin.

No. 278, Int. 222, G. O. 301 — Mr. Warner :

An act to provide a lien to the keeper or *boarder of horses* and other animals.

No. 279, Int. 531, G. O. 302 — Mr. Congdon :

An act to amend section eighty-two, article three, title four, chapter two, part four of the Revised Statutes, relative to removing indictments to the supreme court from courts of oyer and terminer.

No. 280, Int. 236, G. O. 303 — Mr. Hayes :

An act to amend chapter five hundred and fifteen of the Laws of eighteen hundred and seventy-one, entitled "An act to prevent fraud in auction sales, and fraudulent conduct on the part of auctioneers in the cities of New York and Brooklyn."

No. 282, Int. 363, G. O. 305 — Mr. Curtis :

An act to legalize the official acts and proceedings of John Bradley Bliven, a justice of the peace of Chenango county.

No. 283, Int. 247, G. O. 306 — Mr. Clowes :

An act relating to the term of office of supervisors in the several towns of Queens county.

No. 291, Int. 416, G. O. 314 — Mr. Mooers :

An act to amend an act entitled "An act creating a board of town auditors in the several towns in this State, and to prescribe their powers and duties," passed April twentieth, eighteen hundred and seventy-five.

No. 293, Int. 563, G. O. 316 — Mr. Travis :

An act in relation to the superintendents of the poor of the county of Westchester, and the keeper of the county house in said county.

No. 294, Int. 199, G. O. 317 — Mr. Strait :

An act to enable the respective towns in the county of Rensselaer to reduce the number of its town officers.

**No. 295, Int. 306, G. O. 318 — Mr. Douglass :**

An act to abolish the office of railroad commissioners of the town of Augusta, in the county of Oneida, and to authorize the supervisor of said town to discharge the duties now pertaining to said office.

**No. 296, Int. 290, G. O. 319 — Mr. Potts :**

An act to exempt the corporation of the village of Monticello, in Sullivan county, and the trustees and other officers of said village, from the provisions of chapter four hundred and forty of the Laws of eighteen hundred and seventy-three, entitled "An act requiring commissioners of highways to act as inspectors of plank roads and turnpikes," passed May eighth, eighteen hundred and seventy-three.

**No. 307, Int. 644, G. O. 330 — Mr. Kennedy :**

An act to amend an act entitled "An act supplementary to chapter two hundred and seventy-three of the Laws of eighteen hundred and sixty-six, entitled 'An act authorizing the incorporation of associations to erect monuments to perpetuate the memory of soldiers who fell in defense of the Union,'" passed April fourteenth, eighteen hundred and seventy-seven.

**No. 309, Int. 405, G. O. 334 — Mr. Rhodes :**

An act to incorporate the board of trustees of the fire department of the city of Troy.

**No. 312, Int. 558, G. O. 337 — Mr. Hayes :**

An act for the relief of persons who performed the duties of clerks and assistant clerks of district courts in the city of New York, in the year one thousand eight hundred and seventy-six.

**No. 317, Int. 484, G. O. 343 — Mr. Clowes :**

An act creating a board of town auditors in the town of Newtown, Queens county, and prescribing their powers and duties.

**No. 318, Int. 581, G. O. 344 — Mr. Chamberlain :**

An act to authorize the town of Madrid, in the county of St. Lawrence, to borrow money for the completion of the water-works in the village of Madrid, and for other purposes.

**No. 319, Int. 628, G. O. 345 — Mr. Howland :**

An act concerning the manufacture of salt and the inspection thereof.

**No. 320, Int. 619, G. O. 346 — Mr. Cookinham :**

An act to legalize the official acts of Samuel Williams, a justice of the peace of Bridgewater, in the county of Oneida.

**No. 322, Int. 372, G. O. 348 — Mr. Strait :**

An act entitled "An act providing for the verification of pleadings in the justices' court."

No. 323, Int. 471, G. O. 349 — Mr. Kennedy :

An act to regulate the use of intoxicating liquors in poor-houses, juvenile reformatories, protectories, houses of refuge, jails, penitentiaries and prisons.

No. 326, Int. 542, G. O. 352 — Mr. Van Valkenburgh :

An act to legalize the acts of George M. Warren, a justice of the peace of the town of Wheatfield, Niagara county.

No. 330, Int. 686, G. O. 356 — Committee on Insurance :

An act to authorize joint-stock fire insurance companies to issue policies providing against loss or damage by lightning.

No. 333, Int. 613, G. O. 359 — Mr. Lefever :

An act to provide for the navigation of the waters of the Wallkill creek in the county of Ulster by steamboats.

No. 338, Int. 499, G. O. 365 — Mr. Root :

An act to regulate voting in the Western New York Agricultural Society.

No. 341, Int. 486, G. O. 367 — Mr. Clowes :

An act to enable the town of Newtown, in Queens county, to fund a portion of its bonded debt at a reduced rate of interest.

Senate Bill No. 51, Int. 98, G. O. 46 — Mr. Seebacher :

An act to authorize the police department or board of police of any city to appoint policemen of district telegraph companies.

Senate Bill No. 112, Int. 156, G. O. 133 — Mr. Loomis :

An act to confirm the proceedings of the board of trustees of the village of Attica relating to the sale and purchase of real estate.

Senate Bill, not printed, Int. 7, G. O. 147 — Mr. Robertson :

An act to amend chapter 476 of the Laws of 1869, entitled "An act to establish the office of receiver of taxes in the town of New Rochelle, in the county of Westchester."

No. 192, Int. 83, G. O. 208 — Mr. Sheridan :

An act to further amend chapter 491 of the Laws of 1871, entitled "An act to provide for the relief of and support of the poor of the county of Kings, and to change the name of the office of the superintendents of the poor therein to the office of the commissioners of charities of the county of Kings," passed April 14, 1871:

No. 302 Int. 373, G. O. 325 — Mr. Lefever :

An act to release all that part of the waters of the Wallkill creek, and its inlets lying and being in the county of Ulster, from the operation of the provisions of sections 23, 24 and 26 of chapter 534 of the Laws of 1879, entitled "An act for the preservation of moose, wild deer, birds, fish and other game," passed June 20th, 1879.

# STATE OF NEW YORK.

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No. 83.

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## IN ASSEMBLY,

MARCH 9, 1880.

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### REPORT

FROM THE SECRETARY OF STATE, IN ANSWER TO A  
RESOLUTION OF THE ASSEMBLY.

To the Hon. GEORGE H. SHARPE,

*Speaker of the Assembly:*

SIR—In pursuance of the resolution of the Honorable the Assembly, passed the 27th day of February, 1880, calling for a transcript of all legislation on file in this office and information in possession of the Secretary of State relating to the granting of rights or privileges to erect docks, piers, etc., inside the limits of the city of New York, as fixed and determined “by the grants of James the Second and the charters of Thomas Dongan and Montgomerie,” during the last twenty-seven years, I have the honor to report that, from as careful an examination of the records of this office as I have been able to make, no grant has been made by any law, enacted within the time specified in said resolution, conferring upon any corporation or individual the right to erect docks, piers, etc., upon the west bank of the Hudson river, within the limits of the said city and State, and I have no information as to the rights and privileges claimed by corporations and individuals erecting such docks, piers, etc.

Very respectfully,

JOSEPH B. CARR,

*Secretary of State.*



STATE OF NEW YORK.

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No. 84.

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IN ASSEMBLY,

MARCH 10, 1880.

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THIRTY-SIXTH ANNUAL REPORT OF THE SUPERINTEND-  
ENT OF PUBLIC INSTRUCTION AND THE REGENTS  
OF THE UNIVERSITY, ON THE NEW YORK STATE NOR-  
MAL SCHOOL AT ALBANY.

*To the Legislature :*

Pursuant to the act, chapter 318 of the Laws of 1848, the under-  
signed herewith transmit their annual report, containing a full state-  
ment of their proceedings, and of the expenditures of money for the  
support of said school, together with a detailed statement of the pro-  
gress, condition, and prospects thereof, as shown by the accompany-  
ing report of the executive committee.

NEIL GILMOUR,

*Superintendent of Public Instruction.*

By order of the Regents.

ERASTUS C. BENEDICT,

*Chancellor of the University.*





# REPORT.

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ALBANY, March 10, 1880.

*To the Superintendent of Public Instruction and the Regents of the University:*

The Executive Committee of the State Normal School at Albany, respectfully submit this, their thirty-sixth annual report :

During the year embracing the sixty-ninth and seventieth terms, one hundred and seventy-five new students were admitted to the school. These added to the number previously admitted, who had returned to the school to complete their course, made the whole number in attendance during the year, three hundred and sixty-seven, representing forty-seven counties. Of these students, 129 were males, and 238 were females.

The number of graduates of the sixty-ninth term, the first of the last year, was :

Males .....	11
Females .....	19
	<hr/>
	30

Of the seventieth or second term of the year, the number of graduates was :

Males .....	19
Females .....	21
	<hr/>
	40

Whole number of graduates during the year .....	<hr/>
	70
	<hr/>

It is believed that the graduates without exception desired employment as teachers, and nearly all of them are now engaged in teaching; the disposition in some quarters to employ cheap teachers lessened the demand for Normal graduates; but that state of things has in a measure ceased, and the demand for competent teachers is increasing.

A large number from the undergraduate classes are engaged in teaching district schools; of these, nearly all who were successful in their course while in the school intend to return and graduate. The school thus constantly furnishes from its undergraduates a large number of teachers to districts which could not command the services of a graduate, but which receive, to a considerable extent, the benefit of Normal methods.

There have been no changes in the faculty during the year. With increasing experience, the teachers are diligently employed, not in ordinary class-work, but in endeavoring to lead their pupils to form the mental habits and to acquire the methods of instruction necessary to render them successful teachers.

The following is a list of the officers of the school in all departments:

#### EXECUTIVE COMMITTEE.

Hon. Neil Gilmour, Superintendent of Public Instruction and chairman *ex officio*; Samuel B. Woolworth, LL.D.; Prof. Jacob S. Mosher, M.D., Ph. D.; Hon. Robert H. Pruyn, LL.D.; Hon. Charles E. Smith.

#### FACULTY.

Joseph Alden, D. D., LL. D., President and Professor of Mental and Moral Philosophy.

Albert N. Husted, A. M., Professor of Mathematics.

William V. Jones, A. M., Adjunct Professor of Mathematics.

Joseph S. St. John, Professor of Natural Science.

John B. Marsh, Teacher of Vocal Music.

Miss Kate Stoneman, Teacher of Geography, Drawing and Penmanship.

Miss Mary A. McClelland, Teacher of English Grammar and History.

Miss Mary F. Hyde, Teacher of Arithmetic and Geometry.

Miss Caroline Bishop, Teacher of Elocution.

Miss Annie E. Farrand, Teacher of Arithmetic and Algebra.

Mrs. Meriba A. B. Kelly, Superintendent of Model School.

Miss Ellen Bishop, Assistant in the Model School.

#### CIRCULAR.

##### *Design of the Normal School.*

The design of the institution is to furnish well-qualified teachers for the public schools of the State of New York. Students receive a thorough drilling in all the branches which they will be called to teach, and in such other studies as experience has shown to be best adapted to discipline and develop the mind. Those who train the mind of others should themselves have well-trained minds.

Besides receiving from the faculty instruction in the art of teaching, the pupils are, at the proper stages of their progress, required to teach in the Model and Primary Schools, for a term of nine weeks, under the supervision and criticism of the president and other teachers.

The course of instruction and practice occupies two years. The year is divided into two terms of twenty weeks each. The students are divided into four classes. These, for purposes of recitation, are subdivided into as many sections as circumstances may require.

## COURSE OF STUDIES.

*Junior Class — First Term.*

Arithmetic, algebra, English grammar, geography, physiology, map drawing and penmanship.

*Junior Class — Second Term.*

Algebra continued, higher arithmetic, elocution, natural philosophy, botany, rhetoric, English grammar, geometry, history of the United States.

*Senior Class — First Term.*

Geometry continued, ethics, philosophy continued, astronomy, science of government, higher algebra, the English language, history, free-hand and industrial drawing.

*Senior Class — Second Term.*

English literature, mental philosophy, trigonometry and surveying, chemistry, geology, book-keeping, evidences of christianity, Butler's analogy.

Composition and vocal music receive prominent attention throughout the course.

## TERMS OF ADMISSION.

All candidates for admission to the school must furnish satisfactory evidence of good moral character.

Candidates for admission to the lowest class must, if ladies, be not less than sixteen years of age; and if gentlemen, not less than eighteen. They must pass a satisfactory examination in spelling, reading, writing, geography, arithmetic, and English grammar, and must subscribe a declaration that their object in connecting themselves with the school is to prepare themselves for the work of instruction in the public schools of the State.

Those who desire to enter on an advanced standing must, in addition to the examination above mentioned, pass a satisfactory examination in all the studies which have been pursued by the class to which they seek admission.

Those who would avail themselves of the best advantages afforded by the institution should take the whole course. A large part of the instruction given is oral. Much of this must be lost to those entering an advanced class. If any part of the course be omitted, it should be the latter part.

## PERSONS ENTITLED TO ADMISSION.

Each county is entitled to twice as many pupils as it has representatives in the Assembly. Students are appointed by the Superintendent of Public Instruction, on recommendation of the school commissioners, subject to the required examination. When the quota of a county is

filled, candidates having the proper qualifications will be appointed to fill vacancies in the representation of other counties, on application to the president. As such vacancies have always existed, the school is practically open to all who desire to fit themselves to become teachers.

#### CERTIFICATE OF APPOINTMENT.

To \_\_\_\_\_, Superintendent of Public Instruction:

This will certify that \_\_\_\_\_ of \_\_\_\_\_ in the county of \_\_\_\_\_, aged \_\_\_\_\_ years, is recommended as a suitable candidate for appointment as a pupil in the State Normal School at Albany, from the \_\_\_\_\_ Assembly district, in the county of \_\_\_\_\_

School Commissioner of the county of \_\_\_\_\_

Dated \_\_\_\_\_, 18 \_\_\_\_\_.

The recommendation should in each case be sent to the Superintendent of Public Instruction for approval.

#### TUITION AND TEXT-BOOKS.

Tuition and text-books are furnished free of charge. Mileage about equal to the fare necessarily paid in coming by public conveyance to the school will be paid to those who are present at the beginning of the term and remain till its close.

By an act of the Legislature, passed April 11, 1849, "every teacher shall be deemed a qualified teacher who shall have in possession a diploma from the State Normal School."

#### MILEAGE.

The following table will show the sum a student of each county will receive at the end of the term as traveling expenses:

Counties.	Amount paid to each pupil.	Counties.	Amount paid to each pupil.
Albany.....	—	Fulton.....	\$1 50
Allegany.....	\$9 30	Genesee.....	5 50
Broome.....	5 20	Greene.....	1 05
Cattaraugus.....	9 00	Hamilton.....	4 00
Cayuga.....	3 75	Herkimer.....	1 70
Chautauqua.....	8 30	Jefferson.....	4 80
Chemung.....	7 00	Kings.....	3 50
Chenango.....	3 70	Lewis.....	4 80
Clinton.....	5 50	Livingston.....	5 60
Columbia.....	0 75	Madison.....	3 00
Cortland.....	4 05	Monroe.....	4 60
Delaware.....	5 00	Montgomery.....	0 90
Dutchess.....	1 50	New York.....	3 25
Erie.....	6 00	Niagara.....	5 75
Essex.....	5 60	Oneida.....	2 00
Franklin.....	6 60	Onondaga.....	2 95

Counties.	Amount paid to each pupil.	Counties.	Amount paid to each pupil.
Ontario .....	\$4 50	Schuyler .....	\$5 50
Orange .....	2 65	Seneca .....	4 90
Orleans .....	5 50	Steuben .....	8 00
Oswego .....	4 00	Suffolk .....	5 50
Otsego .....	3 00	Sullivan .....	4 55
Putnam .....	2 00	Tioga .....	6 50
Queens .....	3 75	Tompkins .....	5 25
Rensselaer .....	0 20	Ulster .....	2 00
Richmond .....	3 50	Warren .....	3 25
Rockland .....	3 00	Washington .....	2 50
St. Lawrence .....	6 00	Wayne .....	3 85
Saratoga .....	0 90	Westchester .....	3 00
Schenectady .....	0 45	Wyoming .....	7 00
Schoharie .....	1 50	Yates .....	5 50

### THE MODEL SCHOOL.

This school is designed to furnish models of organization, government and instruction, and to afford ample opportunities for observance and practice on the part of the pupils of the Normal School.

Applications for admission to the Model School should be made to the superintendent, Mrs. Kelly. For tuition and text-books a charge is made of ten dollars per term of nineteen weeks.

#### *Normal School in account with Executive Committee.*

1878-9.

Balance from last year .....	\$107 26
Received from application for support .....	18,666 87
Tuition in model school .....	1,043 50
Miscellaneous .....	4 50
	<hr/>
	\$19,822 13
	<hr/>
Paid salaries, Normal School .....	\$14,205 00
Paid salaries, Model School .....	1,600 00
Text-books, Normal School .....	453 76
Text-books, Model School .....	48 86
Chemicals .....	8 73
Repairs .....	43 55
Fuel .....	543 28
Apparatus .....	21 24
Mileage .....	727 00
Contingents .....	2,013 12
Balance .....	157 59
	<hr/>
	\$19,822 13

Respectfully submitted,

S. B. WOOLWORTH,  
ROBT H. PRUYN,  
JACOB S. MOSHER,  
*Executive Committee.*



# STATE OF NEW YORK.

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No. 85.

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## IN ASSEMBLY,

MARCH 11, 1880.

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### THIRTY-NINTH ANNUAL REPORT

(FOR THE YEAR 1879)

OF THE NEW YORK STATE AGRICULTURAL SOCIETY.

NEW YORK STATE AGRICULTURAL SOCIETY, }  
ALBANY, *March 10, 1880.*

The Hon. GEORGE H. SHARPE,

*Speaker of the Assembly:*

SIR — I have the honor to transmit herewith to the Legislature the Thirty-ninth Annual Report (for the year 1879) of the New York State Agricultural Society, with the accompanying abstracts and documents.

Very respectfully,

T. L. HARISON,

*Corresponding Secretary.*





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## OFFICERS FOR 1880.

PRESIDENT — N. MARTIN CURTIS, of St. Lawrence county.

### VICE-PRESIDENTS:

FIRST DISTRICT — JOHN D. WING, of New York.  
SECOND " — ISAAC H. COCKS, of Queens.  
THIRD " — JOSEPH HILTON, of Albany.  
FOURTH " — GEORGE F. MILLS, of Montgomery.  
FIFTH " — JAMES GEDDES, of Onondaga.  
SIXTH " — JOSEPH JULIAN, of Chenango.  
SEVENTH " — ROBERU J. SWAN, of Seneca.  
EIGHTH " — MARCUS H. PHILLIPS, of Orleans.

CORRESPONDING SECRETARY — THOMAS L. HARISON, of St. Lawrence

RECORDING SECRETARY — WILLIAM H. BOGART, of Cayuga.

TREASURER — ADIN THAYER, of Rensselaer.

### EXECUTIVE COMMITTEE:

JESSE OWEN, of Chemung.	GEORGE TWEDDLE, of Albany.
D. D. S. BROWN, of Monroe.	GERRIT S. MILLER, of Madison.
SAMUEL L. HOXIE, of Otsego.	JACOB J. DeFOREST, of Schenectady.
J. V. H. SCOVILLE, of Oneida.	DAVIS COSSITT, of Onondaga.

### EX-PRESIDENTS:

ALEX. S. DIVEN, of Chemung.	PATRICK BARRY, of Monroe.
EDWIN THORNE, of Dutchess.	GEORGE W. HOFFMAN, of Chemung.

HORATIO SEYMOUR, of Oneida.

MECHANICAL AND CONSULTING ENGINEER — H. WATERMAN, Hudson, N. Y.

CONSULTING VETERINARIAN — JAMES LAW, M. R. V. C.,  
Cornell University, Ithaca, N. Y.

CHEMIST — WM. M. HABIRSHAW, F. C. S., 159 Front St., New York.

# REPORT.

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## REPORT OF THE EXECUTIVE COMMITTEE.

*To the Honorable the Legislature :*

The season of 1879 was in most parts of the State of New York favorable to the production of the staple crops, and in general large returns are reported. The yield of wheat in some of the central and southern central counties was somewhat diminished by drought and by the injury done by the Hessian fly, and drought reduced also the products of meadows and pastures. With similar exceptions the yield of orchards has been very large, and all parts of the State report a very large crop of potatoes, though, as usual in years of large crops, there has been some disease.

The hop crop was moderate in quantity, but from the price obtained for it, one of the most profitable in many years. Remunerative prices have also been obtained for grain of all kinds, and in the latter part of the season for the products of the dairy. Upon the whole, the year just closed is to be recorded as one of abundance, and as having brought to the agriculture of New York in some measure a return of prosperity, with fresh hopes for a fuller return yet to come.

Within a few weeks after the society's annual meeting, the action of the British government in prohibiting the importation of live cattle from the United States on account of the existence of pleuropneumonia (the contagious lung-plague of cattle) in this country, called public attention to the subject, and rendered action for its suppression necessary. The fact that this disease had been imported in 1843, and had never since entirely disappeared, was known to those who had paid attention to the matter, but as it had been confined to a very small area, comparatively, and as the course of our cattle traffic is such that there had at no time appeared to be any serious danger of its spreading widely, its existence within our borders had hitherto excited but little apprehension, and in some quarters was even forgotten or denied. It was exceedingly fortunate that we were compelled to take action in regard to this disease just at the time when, as investigation showed, it was beginning to threaten to extend to the dairy and grazing districts—once intro-

duced into which its progress westward would have been far more difficult to arrest.

Upon the facts being represented to him, and after the necessity for action had been shown by investigation, the governor took prompt measures, under the law passed in 1878 in relation to infectious and contagious diseases of animals. The legislature at once made an appropriation to defray the expense, and the task of suppressing the disease was entered upon immediately with vigor, and has been prosecuted during the year efficiently, economically and with success.

At the present time the condition of the matter is as follows: The New England States are free from the disease, New York is clear with the exception of the suburbs of Brooklyn and of one dairy herd under quarantine in Putnam county, six in Westchester and five in New York, and the prospect is that in a few months, if the work is vigorously pressed, there will be left only the duty of guarding against infection from outside our territory. In New Jersey and Pennsylvania laws similar to that in force in our State have been enacted, and progress has been made toward extirpating the disease. In Maryland and Virginia, and in the District of Columbia, it is not known that any thing has yet been done.

The following resolutions expressing the views of the executive committee upon the subject were adopted at a meeting held May 2d:

*Resolved*, That while this committee is well aware of the fact that there is reasonable doubt whether the disease of neat cattle which exists, or has existed, in some milk dairies in Kings county, and in other counties of this State, and which has been pronounced by high veterinary authority to be identical with the contagious pleuro-pneumonia of Europe, is really that very contagious and destructive disease, and of the same virulent character and form as that in which it prevails now in Europe, and in which it appeared on the only occasion of its serious prevalence in the United States, in Massachusetts in the years 1859 and 1860, this committee nevertheless considers that the action of the State authorities in putting in force the law of 1878 for the suppression of this disease has been wise and proper; not only because the disease, whether its identity be or be not established, causes such an amount of loss to the milkmen who supply the cities of New York and Brooklyn, and so endangers the health of the inhabitants of those cities, by adding to the risk of their being supplied with unwholesome milk, that its suppression is a matter of public importance, but because, until it shall be suppressed, and while it is held by the veterinary advisers of the government of Great Britain to be the disease known to them as contagious pleuro-pneumonia, it constitutes an obstacle to the re-establishment of our trade with that country in live cattle and other stock, an obstacle which the State of New York, and other States in which the disease is reported to exist, ought to remove, in deference to the interests of all the States which are benefited by this trade.

*Resolved*, That this committee respectfully thanks the governor and legislature for their prompt action in taking measures to con

trol and suppress the disease in question, in amending the act of 1878 so as to make its provisions more effectual and its administration more economical, and in supplying the money so far required.

*Resolved*, That since the disease in question is reported to exist, or to be occasionally found in the States of New Jersey, Pennsylvania, Maryland and Virginia, in the neighborhood of the large cities of those States, and in the neighborhood of Washington, though not extending into the country, or, as yet, found at any place far from the sea-board, it is the opinion of this committee that the suppression of the disease can only be accomplished by the concerted and harmonious action of the authorities and legislatures of all the States so far involved, and that if such concert of action cannot be promptly secured, the importance of the subject and the emergency of the occasion are such as to excuse, if not to justify us, notwithstanding the State of New York has both the will and the power to execute the work within her own boundaries, in asking the action of congress and of the general government to bring about the result desired.

*Resolved*, That a sub-committee, of which he shall be chairman, be appointed by the president of the society for the full consideration of this subject, that this committee be instructed to present the views in the foregoing resolutions set forth, to the executive authorities and to the legislatures of the several States concerned, and to the congress and to the president of the United States, and to take such steps as may seem expedient to promote the object of relieving this country from even the suspicion of harboring infectious or contagious disease.

It is to be remarked, however, that while now, as heretofore, a very large proportion of the people of the State are uninformed as to the existence and character of the disease and of the impending danger which its gradual but, if unrestrained, steadily accelerating spread surely implies, there can no longer, in the light of the facts ascertained during the past year, be any reasonable doubt of its identity with the lung-plague of Europe, or as to its being just as contagious and just as virulent here as in the countries in which it was first studied and described.

The chemist of the society has made eighteen analyses of fertilizers during the year, under the offer to do the work gratuitously whenever requested through the secretary of any agricultural association in the State. Of these, eight were made for the Skaneateles Farmers' Club, one for the Ontario County Agricultural Society, and nine for the Franklinville Grange in Suffolk county. He has also in hand analyses of brewers' grains, and of starch factory refuse, in the course of which several doubtful or unsettled scientific questions have arisen, and which he holds until these questions can be satisfactorily determined.

The society held the 39th annual cattle show and fair at Utica, beginning on the 8th of September.

The executive committee at the meeting held May 2d, concluded an arrangement with the Utica Park Association for the occupation of the grounds owned by that corporation, whose officers at once proceeded to erect the necessary buildings, and to prepare the grounds for the society's accommodation. The provision made was satisfactory, and the grounds were found to be well adapted to the purpose, though not so accessible as might be wished. The Utica park can be made in time one of the most pleasant places in the State for the State fairs, notwithstanding the difficulty or impossibility of compact arrangement, which exists wherever the grounds have a full mile race-course. The show was a good one, especially as regards live stock, the display of cattle, in particular, being one of the largest and best ever made by the society. The attendance of visitors was much less than was expected, and the receipts fell short of the amount required to pay the expenses and the premiums. The executive committee are glad, however, that by the public spirit and liberality of its citizens, the society has been enabled to re-visit Utica, one of the earliest of our cities to give a welcome to the society, and from which we had at a former period what might almost be called a standing invitation, and invariably a cordial reception.

The executive committee record with deep regret the removal by death, during the past year, of several valued members of the society. Mr. Joseph N. Sturtevant, of Massachusetts, died on the 19th of January, at an early age, but having already done much useful work in the cause of agriculture. The Hon. Goldsmith Dennison, of Orange county, died on the 15th of February, at the age of 78. Mr. Dennison was prominent for many years in the society, and contributed to the Transactions the survey of his county and a valuable report upon the culture of the grape in our State. Dr. E. Ware Sylvester, of Wayne county, died on the 29th of March. Dr. Sylvester was one of the best informed and most successful nurserymen of Western New York, and a constant attendant at our exhibitions as competitor or judge.

Dr. Asa Fitch, of Washington county, died on the 8th of April. Appointed entomologist of the society twenty-five years ago, Dr. Fitch began the series of reports upon the injurious and beneficial insects of the State, which have been so useful to our farmers and gardeners, and by which the merits of the author, as a patient and accurate observer, have obtained a recognition no less in foreign countries than in our own.

## TREASURER'S REPORT.

*Dr.*

Balance from last account.....	\$1,784 43
Utica Fair—ticket sales.....	\$11,089 74
do refreshment privileges.....	1,317 25
	<hr/> 12,406 99
Sales of catalogues.....	111 48
Police justice, fines.....	15 00
Annual memberships.....	553 50
Life memberships.....	40 00.
Secretary's office.....	23 41
State appropriation:	
1878 acct. premiums.....	\$2,857 20
1879 do .....	4,764 80
	<hr/> 7,622 00
Annual State appropriation.....	1,706 25
Balance to new account due treasurer.....	30 28
Total.....	<hr/> <u>\$24,293 34</u>

*Cr.*

Expenses of annual meeting.....	\$76 28
Expenses of previous years.....	749 70
Salaries and traveling expenses.....	3,615 10
Incidental expenses of office.....	76 74
Postage, etc.....	50 95
Library and museum.....	113 20
Elmira Fair Grounds.....	348 70
Expenses of Utica Fair.....	6,399 23
Premiums at Utica Fair.....	7,881 64
Debt and interest.....	4,981 80
Total.....	<hr/> \$24,293 34
Balance due treasurer.....	30 28



## ANALYSES OF FERTILIZERS, MADE IN 1879.

By W. M. HABIRSHAW, F. C. S., for the New York State Agricultural Society.

1. Fish scrap, manufactured by P. White's Sons, New York — price \$28 per ton :		
Water at 100 C.....	20.97	
Nitrogen, 5.01 = ammonia.....	6.05	
2. "Blood, meat and bone" (tankage), manufactured by P. White's Sons, New York — price \$36 per ton :		
Water at 100 C.....	9.93	
Nitrogen, 10.07 = ammonia.....	12.23	
Phosphoric acid.....	8.68	
3. Superphosphate, manufactured by P. White's Sons, New York — price \$36 per ton :		
Water at 100 C.....	12.78	
Nitrogen, 2.66 = ammonia.....	3.23	
Phosphoric acid, soluble.....	8.17	
Phosphoric acid, reverted.....	8.75	
Phosphoric acid, insoluble.....	1.78	
Potash.....	0.31	
4. Superphosphate, "Long Island oat manure," manufactured by Mapes & Co., 158 Front st., New York — price \$43.60 (cash in New York city) per ton :		
Water at 100 C.....	11.96	
Nitrogen, 4.28 = ammonia.....	5.20	
Phosphoric acid, soluble.....	2.87	
Phosphoric acid, reverted.....	5.15	
Phosphoric acid, insoluble.....	0.69	
Potash.....	5.65	
5. Superphosphate, "onion fertilizer," manufactured by Rafferty & Williams — price \$44.50 per ton :		
Water at 100 C.....	6.89	
Nitrogen, 4.16 = ammonia.....	5.05	
Phosphoric acid, soluble.....	2.33	
Phosphoric acid, reverted.....	3.83	
Phosphoric acid, insoluble.....	0.89	
Potash.....	5.67	
6. Peruvian guano, "old-fashion Peruvian guano," from the Mapes Formula and Peruvian Guano Co., 158 Front st., New York — price \$52.50 per ton :		
Water at 100 C.....	9.77	
Nitrogen, 8.79 = ammonia.....	10.68	
Phosphoric acid.....	12.65	
Potash.....	2.50	
7. "Guanape guano, from Hobson, Hurtado & Co." purchased of Gildersleeve & Co. — price \$54 per ton :		
Water at 100 C.....	10.09	

Nitrogen, 5.39 = ammonia.....	6.55
Phosphoric acid.....	13.33
Potash.....	3.50
8. Coarse ground bone, manufactured by P. White's Sons, New York — price \$36 per ton:	
Water at 100 C.....	6.85
Nitrogen, 2.58 = ammonia.....	3.13
Phosphoric acid.....	16.98
9. Muriate of potash, purchased of Baker & Co., 215 Pearl st., New York — price \$35 per ton:	
Potash.....	50.98
Equal to potassium chloride.....	80.69
10. Soluble Pacific Guano, Pacific Guano Co., Boston, Mass. — price \$37 per ton:	
Water at 100 C.....	11.39
Nitrogen from organic matter.....	2.84
Equivalent to ammonia.....	3.45
Soluble and reverted phosphoric acid.....	9.56
Equivalent to bone phosphate.....	20.87
Insoluble phosphoric acid.....	1.76
Equivalent to bone phosphate.....	3.84
Potash soluble in water.....	1.91
11. Central City Superphosphate, Syracuse Phosphate Co., Syracuse, N. Y. — \$33 per ton:	
Water at 100 C.....	15.59
Nitrogen from organic matter.....	2.08
Equivalent to ammonia.....	2.53
Soluble and reverted phosphoric acid.....	14.88
Equivalent to bone phosphate.....	32.58
Insoluble phosphoric acid.....	Traces.
Equivalent to bone phosphate.....	do
Potash soluble in water.....	3.04
12. Manhattan Blood Guano, Manhattan Fertilizer Co., New York — \$38 per ton:	
Water at 100 C.....	16.38
Nitrogen from organic matter.....	2.30
Equivalent to ammonia.....	2.79
Soluble and reverted phosphoric acid.....	9.16
Equivalent to bone phosphate.....	20.00
Insoluble phosphoric acid.....	1.15
Equivalent to bone phosphate.....	2.51
Potash soluble in water.....	0.68
13. Nitrified Superior Phosphate, New York Phosphate Works, New York — \$36 per ton:	
Water at 100 C.....	19.11
Nitrogen from organic matter.....	2.41
Equivalent to ammonia.....	2.93
Soluble and reverted phosphoric acid.....	7.29
Equivalent to bone phosphate.....	15.91

Insoluble phosphoric acid.....	Traces.
Equivalent to bone phosphate.....	do
Potash soluble in water.....	0.15
14. Superphosphate, Frank Coe, Brooklyn, N. Y.—\$37 per ton:	
Water at 100 C.....	11.65
Nitrogen from organic matter.....	2.30
Equivalent to ammonia.....	2.79
Soluble and reverted phosphoric acid.....	12.04
Equivalent to bone phosphate.....	26.28
Insoluble phosphoric acid.....	2.35
Equivalent to bone phosphate.....	5.13
Potash soluble in water.....	0.81
15. Superphosphate, L. L. Crocker, Buffalo, N. Y.—\$35 per ton:	
Water at 100 C.....	9.64
Nitrogen from organic matter.....	3.83
Equivalent to ammonia.....	4.66
Soluble and reverted phosphoric acid.....	9.11
Equivalent to bone phosphate.....	19.89
Insoluble phosphoric acid.....	Traces.
Equivalent to bone phosphate.....	do
Potash soluble in water.....	1.28
16. Superphosphate, Bradley & Co., Boston, Mass.—\$35 per ton:	
Water at 100 C.....	9.83
Nitrogen from organic matter.....	2.84
Equivalent to ammonia.....	3.45
Soluble and reverted phosphoric acid.....	10.33
Equivalent to bone phosphate.....	22.65
Insoluble phosphoric acid.....	1.26
Equivalent to bone phosphate.....	2.75
Potash soluble in water.....	Traces.
17. National Superphosphate, U. S. Fertilizing and Chem- ical Co., Camden, N. J.—\$34 per ton:	
Water at 100 C.....	11.59
Nitrogen from organic matter.....	1.32
Equivalent to ammonia.....	1.61
Soluble and reverted phosphoric acid.....	12.16
Equivalent to bone phosphate.....	26.55
Insoluble phosphoric acid.....	1.40
Equivalent to bone phosphate.....	3.05
Potash soluble in water.....	1.93
18. Ralston's Ammoniated Superphosphate, John Ralston, New York — \$28.50 per ton:	
Water at 100 C.....	14.68
Nitrogen from organic matter.....	2.67
Equivalent to ammonia.....	3.24

Soluble and reverted phosphoric acid.....	5.47
Equivalent to bone phosphate.....	11.83
Insoluble phosphoric acid.....	Traces.
Equivalent to bone phosphate.....	do
Potash soluble in water.....	1.47

NOTE.—Of the above fertilizers the samples numbered 1 to 9 were sent in by the secretary of the Franklinville Grange, Suffolk Co., and analyzed in May. Samples 10 to 17 were sent by the secretary of the Skaneateles Farmers' Club, September 24, and No. 18 by the secretary of the Ontario Co. Agricultural Society, October 9. The brands of the fertilizers, the manufacturers' or dealers' names and the prices, are given as received from the secretaries respectively, and the society is not responsible for their correctness.

## ADDRESS OF HORATIO SEYMOUR,

BEFORE THE NEW YORK STATE AGRICULTURAL SOCIETY, AT THE  
ANNUAL MEETING, WEDNESDAY, JANUARY 21, 1880.

I congratulate the Society upon its long and growing usefulness. The names of many of New York's best and leading citizens have been enrolled among its members. In future it will not be less potent in promoting the welfare of the State than it has been in the past.

By your rules it is my duty, as the outgoing President, to speak about the interests it represents. My subject is, "THE CONFLICT BETWEEN AMERICAN AND EUROPEAN AGRICULTURE." At the State fair, in September, I laid before the officers of this Association a paper with regard to this topic. I will avoid, as far as I can, repeating what I then stated.

Agriculture rises above all other of our pursuits in interest and importance. Ever beneficent, it carries life and comfort into the homes of man. It usually bears the aspect of an humble servitor, and is sometimes overlooked when the public mind is filled with more exciting topics. In the end it asserts its value, and brings the world back to a sense of the truth that all wealth and prosperity are based upon the soil and the labor which brings forth its products.

We can find in history no instance when this fact has been brought home to men's minds in a way more striking or on a scale so broad, or with influences so far-reaching, as by the present condition of agriculture on this continent and in Europe. Here, it displays its bounties. There, nature withholds its accustomed products, and want and suffering creep into the homes of labor. On this continent it has given life and energy to all other pursuits and industries. It has lifted the burthens of debt from our country, given it credit with the world, and honor in the eyes of all nations. In Europe, the want of food has injured industry, and has embarrassed govern-

ments. In this country, it has solved problems in finance which perplexed our legislators. While they doubted and disputed, the statesmanship of the plow found the remedies for our troubles. The tillers of the soil have done the work. They followed God's fiat and not that of men. The sweat of the brow, and not the schemes of the brain, have rescued us from our perplexities. In Europe, the condition of agriculture makes suffering which threatens great social and political changes.

What is the significance of these portents? The limit of an address will admit only of a meagre sketch of facts and conclusions. When we try to forecast the future, we may fall into many errors and overlook many truths; but it is our duty, at times, when there are impending changes, to scan the horizon and learn what we can of coming events.

#### ARE THE ADVANTAGES WHICH OUR FARMERS NOW HAVE DUE TO ACCIDENTAL CAUSES, OR CAN THEY HOLD THEM FOR ENDURING REASONS.

The immediate causes of our prosperity have been the abundance of our crops and a failure in those of Europe. We cannot count upon these in our plans for the future. The next summer may reverse the fact, and Europe may produce an abundance, and we may lose from unfavorable influences upon our fields. Will our advantages pass away with the year just closed, or have there been developed underlying conditions which have been gradually forming, and which are now to show themselves with great power and in grand proportions? This is, for us, the overshadowing question of the day, and it will lead us into many investigations before it is solved. It is the most important that can be pressed upon the minds of our people. It concerns every citizen, every family, every pursuit. If we push on blindly and assume that the coming years are to make plenty here and want elsewhere, we may be speedily overwhelmed by disaster. I believe that our country has entered upon a new era in its relationship with Europe. While it is not probable that our exports of food the next year will equal those of the past, still the channels of commerce which have been opened will not be closed, but will gradually grow wider and deeper. These will make permanent changes in our dealings with that continent.

#### WHAT WILL GROW OUT OF THE FACT THAT STEAMSHIPS AND ELECTRIC CABLES HAVE DRAWN THE OLD AND NEW WORLDS INTO CLOSE CONNECTION?

I know that in entering upon this discussion I am in danger of being drawn beyond the limits of a sober address about farming, and that some things I shall say may seem remote from my topic. But our agriculture is now so far-reaching in its influences, that I ask for a wider range of speech than is usual upon such occasions.

When America was discovered, it was so remote from Europe, in view of the difficulty of reaching it, that it was called a new world. It was regarded as we now look upon planets, and for more than a century but little was known about it. We could only be visited by long and dangerous voyages. Measuring distance by time, it was a year's distance from Europe. But art and science have, as to time and intercourse, drawn the continents together until they are so closely moored that it is easier to pass from one to the other than it is to traverse their respective territories. This fact, that North America, with its vast extent of fertile vacant lands, thus almost touches Europe with its over-crowded population, is one which excites the most varied speculations with regard to the results which must follow, bearing upon all phases of civilization, politics and power. History tells of no event more striking or significant. There is now what properly may be called a conflict between our agriculture and theirs. During the past year we have fairly "bombarDED Europe with casks and barrels of animal and vegetable food." While these relieve famine, they also excite alarm in many quarters by their effects, not only upon their agriculture, but upon social and political organizations. It has become a contest between American farmers and European land-owners. Let us compare the power and resources of the combatants. As the Canadas are occupied by a people speaking the same language and living under laws similar to our own, I include them in my terms when I speak of our side in this competition. When I speak of our continent I do not include Mexico. It is, geographically, one of the connecting links between North and South America, and not strictly a part of either.

#### WHAT TERRITORIES ARE HELD BY THE PARTIES IN THIS CONTEST?

North America exceeds Europe in extent and fertility. Its boundaries reach to both of the great oceans of the earth. Its soil and climate are more favorable to abundance and variety of food. Although our population is only one-sixth that of Europe, we have enough to meet its wants in this year of its distress, and all that we have parted with has made no scarcity here. It has not carried up the price of food as much as it has advanced the wages of labor. The variety of our farm products is a protection against disasters from unfavorable seasons, as some grains are helped by causes which harm others. If an entire wheat crop should be cut off, it would be a great loss, but it would make no hunger here, for it amounts to only a quarter of the product of Indian corn. We have not only a greater variety of the fruits of the earth, but our climate gives them to us in succession, which adds greatly to their value and to the comfort and enjoyment of our people. Before winter has relaxed its hold upon the north we begin from the borders of the Gulf of Mexico to get fruits and vegetables. Free and cheap intercourse between all parts of our common country gives the luxuries of that semi-tropical region to all sections. Following the northward course

of the sun, the season for these varied products is prolonged. We look to their approach from the south to the north rather than to an almanac, to tell us when the summer glow shall give life to vegetation over our vast continent.

#### THE INFLUENCES OF THE TOPOGRAPHY OF THE CONTINENTS UPON THEIR AGRICULTURE.

But it is not only in extent of territory and in abundance and variety of products that nature favors us. While in Europe short rivers and narrow valleys tell of frequent ranges of high lands which hinder commerce; with us lakes and rivers bind our States together with silver links in ways that give us a ready and cheap exchange of all that we raise or make. Spread out before you the maps of the two continents, and note the different influences of mountain ranges and river courses. Leaving out of view the great streams and plains in bleak northern Russia, and of the Danube in eastern Europe, and you will see that the rivers are navigable for short distances, and their valleys are of small extent. The Danube is not as long as the Missouri branch of the Mississippi river. You may divide the valley of the Mississippi into sections which will be equal in area to Great Britain, France, Germany, Austria, Italy and Spain combined, and still there will be about one-sixth left to represent minor countries. Those I have named have only 1,073,000, while the valley of the Mississippi has 1,257,000 square miles of territory. Its waters make about ten thousand miles of navigation, more or less perfect, while its valleys give level routes to a vast system of railways. In our country we have now, of these, nearly ninety thousand miles in length, and they are rapidly extending into new regions.

#### THE GROWTH OF OUR POPULATION.

But natural advantages do not affect the commerce of the world until they are developed by the enterprise and industry of man. One hundred years ago the population of the United States was three millions, and that of Great Britain, when we broke away from its control, was about seven times as many. In ten years our numbers will be about twice those of the United Kingdom. We now have fifty millions, and less than the usual ratio of increase will give us sixty-two millions in 1890. Many who now live will see one hundred millions of busy inhabitants within our borders. There may be a falling off in the ratio of our increase during the next thirty years, but not enough to lower it within the numbers I have stated. If the rulers of Europe adhere to their policies of ambition and wars; if their inhabitants continue to fly from their homes; if their governments are pestilential in their destruction of life, we shall see greater movements to our shores than any heretofore witnessed. In our contest with Europe we take and will continue to

take each year, by immigration, greater numbers of "prisoners of peace" than war has ever wrested from one nation and forced under the domination of another. They are not victims of force; they are not unwilling captives; they join our side and help us on to greatness and power. They bring us arts, and skill, and labor. They enlarge the minds and sympathies of our people by lifting them above mere provincial prejudice. The mingled European races have a vigor superior to any single lineage. We are forming what is not yet fully developed — the American character. Those who study the influence of this intercourse upon the common ground of our country will be impressed with its improvements of all minds and characters. The citizens of Rome were not merely Italians. They adopted those of other nations, and gave the freedom of their city to towns and provinces. Our ways to greatness are more beneficent. Immigration is better than invasions and conquests. If any one of the so-called great powers of Europe should take captive from one of its rivals numbers equal to a single year's immigration to this country, how deep would be the concern and how widespread the agitation over the question of the balance of power! How many councils would be held; how many diplomats would bewilder themselves and the world, about plans to check the growing power of the successful country! Immigrants do not merely give us numbers, but also wealth in a way unknown elsewhere. The money they bring with them amounts in the aggregate to a large sum. But this is unimportant in comparison with another fact: We have many millions of acres of rich lands, which the government holds at a nominal price, or which it will give to actual settlers by our homestead laws. While they are vacant they are of no value. When, in the course of a few years, a million of hardy immigrants, usually in the prime of life, land on our coast, they may be without wealth; but the moment this multitude of poor men and women plant themselves upon the millions of acres of land, of no previous value, the union of two kinds of poverty evolves, as if by a chemical action, enormous wealth! Mere occupations before a crop is raised give prices to the soil which make a vast amount of real wealth. This does not fall away as time goes on, but it grows each year. In our new States, the wealth of our farmers does not merely come from the sum he gets for his products, but beyond this, the land he took up for a homestead, or which he bought for a trifle, gains a value which makes an estate ranging from a few to many thousand dollars in value. Wealth cannot grow in this way in Europe. There, prices at which lands are bought and sold vary but little in the course of a life-time, and all that the owner gains is the value of what he raises. He has no estate growing up under him. He cannot, as is frequently the case with us, spend each year all he earns, and then leave to his family land which has increased fifty or a hundred fold in value since he became its owner. It is this fact which gives our country its swift increase of wealth. This is known to the people of Europe, for the constant correspondence



between those who come here and their friends at their old homes makes them more intelligent about our affairs than their rulers or the wealthy classes. For these reasons, thousands of young Germans, in the vigor of youth, to escape the burthen of military duty, get away from their native land to ours. Every attempt to hold them by force makes their government odious in their eyes.

#### THE INFLUENCE OF POLITICAL ORGANIZATIONS UPON THE PROSPERITY AND AGRICULTURE OF THE TWO CONTINENTS.

Beyond extent of territory, variety of productions, facilities for intercourse and growth of numbers, there is another advantage we enjoy. We cannot correctly scan the future unless we regard the political conditions of the two continents. Europe is cut up into many nationalities, differing in language, laws and customs. To make clear what its people suffer from this cause, and what we gain from free intercourse between all parts of our continent, draw upon our map divisions which show the size of Great Britain, France, Germany, Austria, Spain and Italy. Their united areas will a little more than cover the territory east of the Mississippi — not one-third of our country. The smaller nationalities can be represented at such places as you may find convenient. Arrange upon our map these countries in ways which will not only show their areas as compared with those of each other and with ours, but also so that their positions shall be preserved as far as possible. How long could we endure such division of territory; the barriers to intercourse, aggravated by differences of language and laws; the burthens of great armies; the evils of national hates, and the curse of bloody wars? The boundaries to each of these divisions would limit the spread of knowledge, the progress of civilization and the growth of sympathies among mankind. Every industry would be disturbed and taxed by the cost of great armies. Their rulers would stand as they now do in Europe, armed against each other, as if they deemed their fellow monarchs robbers who watch their chance for plunder. In the light of present civilization, their diplomacy has sunk so low in regard to truth and honor that it tends to demoralize the world. The governments of Europe thus delineated upon the map of our country will teach us not only the drawbacks and evils from which they suffer, but will also give us more clear views of our own blessings, and teach us to value as we should this union, not only of States, but of hearts and hands of those who dwell in our broad country. A day's railway travel in any direction would take us out of the limits of our own, and would bring us into the boundaries of a foreign country. We could not go into the west, nor travel south, without getting beyond the bounds where our language, customs and laws prevail. We could not take those journeys we are accustomed to make to the Mississippi, nor to the Southern States, without mastering many languages, and then being treated as strangers and aliens, and, in many cases, as hostile aliens. Shut up

within narrow limits, we should imbibe the prejudices which mark the people of European countries, and which they display when they first land on our shores. This delineation on our territory of Europe will tell why it has been cursed with wars, revolutions, and bloody changes of relative power. Universal peace is almost unknown on that continent. There, armed neutrality is counted as peace.

Let us brush off this picture of Europe from our map; let us rub out the hateful lines of division, and when we look at it again, we will see, as we have not seen before, why peaceful agriculture and all industries have advantages here unknown elsewhere. We shall breathe more freely when we feel that this whole broad continent is ours, for I include the Canadas in this view of our intercourse.

#### THE DIVISION OF OUR AGRICULTURE INTO GRAND DEPARTMENTS, AND THE EFFECTS OF THIS UPON FARMING AND FARMERS, AND IN GIVING STABILITY TO OUR UNION.

In smaller countries, farmers labor to meet the wants of those about them. They are confined to home markets, and they seek to raise the crops which will meet their limited needs. Their pursuits in such cases do not stir the minds or teach the wants and conditions of other regions and populations. The reverse of this is true with us. Our agriculture is shaping itself into grand departments, each covering extents greater than those of most countries. These lead to improvements in their several pursuits, which cannot be developed when carried on on a smaller scale. The Southern States raise cotton and tobacco. The vast region from Texas to Canada, lying on the foothills and plains east of the Rocky Mountains, is becoming the range for cattle, which are sent to the markets of the Eastern States and Europe. In many of the great Western States Indian corn is the leading product, and one that enables the farmers to send to the markets of the world an enormous quantity of beef, and pork, and lard. At the North-west they raise wheat and other grains; while New York, New England and Pennsylvania lead in dairying. It is true that in these great divisions the farmers do not confine themselves exclusively to the products I have named; yet in each, one of them takes the lead, and is raised on a scale unknown heretofore. Each shapes the business, commerce and transportation of its region in ways which cheapen production and the cost of reaching markets.

When the Pacific States get rid of their gold, there will be another development of agriculture more enriching and beneficial than all that can be dug from mines. God's blessing does not go with the gambling chances of finding lucre in the bowels of the earth, as it does with the industry which works with Him in bringing forth the fruits of the soil.

This system improves not only farming, but the farmers as well. The influences of these great departments of agriculture are not more striking in their results upon production than they are

upon the intelligence of the producers. It cannot be said of them that they are open to the reproach sometimes made to those who labor upon land, that they become torpid, gross and heavy in thought and action. Diffused intelligence gives them a control over mechanical powers. For the culture of great areas we have thus labor under labor, machinery under the control of those who till the soil; thus enlarging their ability to subdue nature and make it yield its fruits to human wants. Here, again, let me ask you to study your maps; unless you keep one in constant view, you cannot get clear ideas of this country. It is too large, too varied in its climate and physical features, to be clearly described by words. We need its picture before us. Let us begin at Texas, and note the modes of life along the slopes of the Rocky Mountains and plains to the borders of Canada. We see energy, courage and intelligence developed and displayed in their exciting pursuits. Those engaged in them must not only exercise wisdom in the care and improvement of their herds, but they must know much about the wants and markets of the East and Europe. They are active in cutting down all uncalled-for charges, and in opening new railroad and water routes. Those who deal in making and selling articles which are used throughout the world, are made more intelligent than those who deal with local markets. They must learn the condition and wants of other people and the laws of commerce. This not only promotes farming, but it improves the mind of the farmer when he thus deals with states and nations afar off. The same truths apply to those who make provisions in States where Indian corn is the chief product. They learn how pork must be cured and packed to meet the views of different markets; how every part of the animals they kill is made valuable by a knowledge of the uses to which it can be put. The hair is sent in one direction, the feet in another, and even the blood is carefully preserved for use in some remote quarter. Where wheat is raised on a large scale, the same truths are manifested. In none are they brought out so distinctly and in such detail as in dairy regions. As most of the cheese and much of the butter made by us is sent to Great Britain, or to the countries on the continent, it is necessary to consult the tastes of foreigners. With regard to these articles they are critical. They are apt to vary in quality, and if this is inferior, they will command but small prices. Skill is required in their production, and the details concern many problems in chemistry and with regard to animal and vegetable life. To meet all these questions numerous societies are organized, where all things relating to this business are discussed. Those engaged in it have been educated upon many subjects which do not, upon first view, seem to be connected with their pursuits. In the country, upon the days when sales are made, the state of the London market is made known by the use of the ocean cable. The prices of gold and of freights are written upon a blackboard, where they can be seen by all. I have on several occasions attended with men of prominence, of our own or of foreign

countries, the sale of these products, and they all expressed surprise when they learned the methods, the intelligence and the range of topics discussed by buyers and sellers.

The active and widespread intelligence thus generated by our departments for the production and our methods for the sale of products, gives assurance of our ability to hold the ground we have gained in the markets of the world. The intercourse and intelligence which grow out of these great departments of agriculture do not merely elevate our farmers and give us commercial success; they make the bonds which hold our Union in firm compact. Party passions may threaten it; ambitious purposes may, for a time, stir up sectional prejudices; but since the late sad war, the growth of agriculture, commerce and intercourse has made a conservative, intelligent influence, which will rebuke passions and purposes which threaten peace and harmony. It is pleasant and assuring to know that nature, in its forms and pursuits, gives life and strength to our political association, and inspires hope that our Union will have nature's endurance.

#### EFFECTS OF OUR AGRICULTURE UPON THE SOCIAL AND POLITICAL SYSTEMS OF EUROPE.

If all the statements I have made are correct, still the fact remains that the people of Europe have heretofore been able to raise most of the food they need. Why can they not hereafter, with the same labor, on the same soil, raise enough to supply their wants, except for the small amount which they have heretofore imported? Why can we expect, with ordinary seasons, that we can sell them more than we have done in past years; why, although we may raise grain and make provisions for less than they can, may not the effect of this be merely to reduce the price which farmers will get and not the amount of food they will produce? Our exports to Europe were large and growing before the failure of its crops. These questions bring into view some facts of great interest in many respects. In the first place, where farmers own their lands, as they do with us, all that they can get for what they sell goes to those who labor upon the soil. But as a rule in Europe, and particularly in Great Britain, what is made upon farms must support at least two and sometimes four classes of persons: the tenant who does the work; the landlords, and usually some agents or middlemen, who hire and sub-let to tenants. Church rates and many other charges must also be paid. When our cheap grains reach their markets, as they will hereafter, and govern the prices of produce, they disturb existing arrangements. The tenant must have enough to live upon then as now; taxes and tithes must be paid, and only what is left will go to the owners. This class are to suffer. If you read the debates in Parliament, you will see that an attempt is made to excite sympathy for British farmers. But the parties who really are affected are British landlords. The conflict is not between American and Brit-

ish farmers, but American and British land-owners. If the cost of produce falls, rents must come down, for tenants can pay no more, and landlords will get no more than prices will give. The tenant cannot live upon less than he now gets, and the loss must fall upon the owner.

Beyond this diminution of revenues, there is a difficulty which affects the structure of political and social organizations. The nobility are landlords. In Britain they are recognized as one of the estates of the government. A class of them constitutes the House of Lords. The theory of most of the European governments is, that families who have personal and political rights beyond the mass of the people, to uphold the dignity and power of their rank, should have large estates, and these must in the main consist of lands. As this rank is hereditary, it must be strengthened by hereditary estates. Personal wealth is too evanescent, too changeable to admit of its being secured by entails. But the tenure of lands can be so arranged that they may be held by families, and made safe from division by the laws of entail and of primogeniture. As Mr. Gladstone has said: "In England inequality lies embedded in the very basis of the social structure. \* \* \* Heredity is in the heart's core of Englishmen."

Our cheap and fertile lands, and the low cost of sending our products to Europe, may work great changes in the condition of the higher classes and the tenures of real estate. This explains the uneasiness they have shown when we send food to relieve the hunger of their people. It is not this merciful work, but the fear that hereafter we may reduce their resources, which disturbs them. If we do, their large estates cannot be held by their present tenures; they must be sold or divided. It is not necessary to dwell upon the great changes this would make in the social and political aspect of Great Britain. The fear of this has already given birth to plans for taxing all food brought from other countries. This has led to a controversy between the landed and manufacturing interests. Britain has been called the workshop of the world; but its artisans are now pressed by competition from many quarters, and are suffering from the low wages they get. How, then, can government tax their food? If this harsh plan be adopted, it will send many of its skilled workmen to us, while those who remain will carry on their trades with increased cost for food, when they are subjected to sharp competition by the very workmen driven to this country, where all the necessaries of life are so much cheaper. They must take our grain or give up classes of their people. We cannot foresee what course they will take, for no one can read the debates in Parliament without being struck with the ignorance of members, not only with respect to our States, but their Canadian Colonies. If their statesmen are as ignorant with regard to their dependencies in Asia and Africa as they are about those on this continent, the British Empire is in great peril of dishonor and disaster. The result probably will be that the land-owners will find that they must not only reduce their

rents, but they must also change the character of their farm products, and buy most of their grain and many of their provisions from us, and our markets in future will be thus enlarged.

If they tax imported food, they will break down their manufactures, destroy their home markets and bring disaster upon their country. If the continental nations tax food, in addition to military and other burthens, they will drive away their young and active citizens and reduce their military strength. Monarchs will be safer from bullets when food is cheap and abundant.

#### WHY OUR HOME MARKETS ARE MADE GOOD BY THE CHARACTER OF OUR CLIMATE.

I have dwelt upon foreign markets, as they deeply concern us; but we must not overlook home transactions, which are still more important. The prosperity which agriculture has given to all other industries will now re-act in its favor and make new demands for its products. Near-by cities and towns make the best customers for our farmers. They buy many things which will not bear long transportation, and which are free from a wide-spread competition. For this reason, in their vicinity, lands bear the highest prices. Those lying near the city of New York sell for sums far beyond those which can be got for better qualities in other quarters. The farmers of New York are helped and not hurt by the currents of commerce from the West. These make the wealth and population of our cities. Manufacturing and mechanical industries, built up by cheap bread, make demands for vegetables, fruit, milk, butter and other articles produced in the immediate vicinity of these home markets. I know that some think that if it cost more to bring produce to us, if charges on canals and railroads were higher, that our farms would be increased in value. This is a great error. They would turn away our commerce. They would tax not only the food of those engaged in varied industries, but of more than two-thirds of our farmers. They would diminish the population of towns and cities, and thus drive away our best customers. Most of my own property is in farms and land, and I have given much thought and study to this subject. If we suffer our canals to be broken down, and thus lose all control of the course of trade; if we consent to any policy which diverts it from our State, we shall undo the work of our fathers, who, by a wise commercial policy, lifted it up from a low to the highest position in our Union, by drawing the enriching currents of trade through its territories. Along the routes of these, all pursuits and industries have been multiplied. When these are crippled or destroyed, our farms will lose a large share of their value.

The great cities of the world are placed in a belt running round the earth, following a certain mean temperature. As the climates of different latitudes vary, this belt follows temperature wherever it sways to the north or south. There may be more fertile lands north or south of this, but their cities are not as large or farms as valuable.

The reason for this is, that there is the most activity and wealth where there are the most wants, with the means for meeting these wants by industry and intelligence. There can be no diffused wealth under the tropics where men wear but scanty clothing; where nature gives food with little or no labor; where slight and open structures make their homes; where there is no use for the thousand things we need, and to produce which great numbers are employed as artisans. Farms are of little or no value under the tropics. If you go to the arctic regions, you find the same poverty. Oil, or the blubber of seals and whales, must be used to keep up life and warmth. No clothes but those of skins and furs will protect from cold, and close huts make homes. In both of these extremes, of the tropic and arctic regions, there are no varied wants to give the wealth which grows out of numerous pursuits and industries. When we leave these extremes and travel toward the temperate zone, we find increasing wants and wealth, until we reach the belt of the greatest variety of products of industry, arts and sciences. Here we find the highest civilization. Here all kinds of real estate bear the highest prices.

It is in our country that these truths are seen in the clearest light. Here there is more business activity, larger cities and towns in proportion to our population than in any other part of the world. This is due to the fact that we have more wants and more means to meet these wants than any other people. Those of an American are at least one-third more than those of an Englishman in the same condition of life. We have arctic winters and tropical summers. Strangers cannot readily understand the variety and quantity of clothing needed here. This leads to the establishment in our towns of great clothing stores, where all articles of apparel are made ready to meet the calls of customers. These supplies are so great and varied that all can be fitted in ways to meet their tastes and wants. These and like arrangements draw to the cities much business, and give to large numbers work which, elsewhere, is done in the country. In winter, our houses and furniture must be of a kind which will fence out cold. I once analyzed the internal commerce of New York, and found that our winter made much the larger part of its volume. We use more furniture in our houses than others. Furnaces to give us heat, which are so common with us, although we have tropical summers, are hardly known in Europe. In winter we store ice for summer use, and in summer our mechanics make implements for winter's work. We must lay in large stores of food for ourselves and cattle. We cannot enumerate all the things that our winters demand beyond those of European countries in the same latitude. We cannot estimate the work and activity which these give to our workshops and factories. When summer comes the change is greater here than elsewhere. Different clothing, implements and many household alterations are needed. The character of labor is altered, particularly with farmers. A new class of demands are made upon the dwellers of cities and towns, and new employments,

given to their artisans. Thus life and activity are imparted to the circle of industry. This accounts for the greater comparative size and number of our cities, the home markets for our farms. If all our people were farmers, and made the simple clothes and furniture used elsewhere, there would be an abundance of food, but little wealth and activity. Some of the smaller countries of Europe give us examples of this state of society. The census of New York shows that in 1875 not one-third of our population were engaged in raising food, and that more than two-thirds are consumers. This proves the importance of upholding our commercial interests, and of increasing the numbers of those who buy farm products.

At the South, where the great majority are tillers of the soil, although they have a monopoly of furnishing the world with cotton, yet their cities are small, their wants are few compared with ours, and their wealth is far less. Our seasons, our wants, our habits, will ever so multiply varied industries, that the farmers of the northern belt of States will have a larger proportion of home consumers, and of near-by markets in great cities, than can be found in any part of Europe in proportion to the number of those who till the soil.

Sir James Campbell, in his recent book about our country, speaks of the size of our cities as disproportionate to the number of our people. A comparison of the relative size of the towns on the continent of Europe and those of the United States makes this fact more striking. Although they have been so recently settled, their cities are outstripping those of other countries. The character of our climate explains this.

Strangers say that we are always in a hurry; so, too, is nature on this continent. It does its work quicker than elsewhere. When winter gives up its grasp upon the vegetable world it springs into life, unfolds its leaves, and yields its fruits in less time than is required in Europe. Our grain grows and ripens in a period at least one-quarter less than in Great Britain. Indian corn at the West sends up great stalks eight or ten feet high and more than an inch in diameter, making food for cattle, and matures their abundant yield of grain for human use within four months from the time the farmer puts seed in the ground. The rapidity with which the products of our fields are ripened makes one of the necessities for the use of machinery. Grain must be gathered in quicker ways than those used in other countries. This fact has had much to do with the invention of methods more ready and effective than the sickle and the scythe. Many of our crops would spoil in the fields if we relied upon labor as it is employed elsewhere.

Here nature not only hurries all its processes, but it is sharp and exacting in its changes. In the summer its heat gives us the plenty and indulgences of a semi-tropical climate. When, in a short time, it has perfected these for our use, it forces us to gather them in without delay, for it soon brings its frosts and arctic winters which drive us to meet new and varied wants, by other and varied industries.



Our seasons do not slowly change, but they excite and stimulate us by marked contrasts of heat and cold, of green fields and of widespread deep coverings of snow and ice. Nature teaches and exacts activity of mind and body in our country.

A full statement would show that the extremes of heat and cold in the northern belt of States will ever be among the most important influences in stimulating the energies, the prosperity and the civilization of the American people.

#### CONCLUSION.

Although we enjoy so many advantages, we must bear in mind that these will not of themselves give us prosperity. To gain this we must have intelligent and patient industry. I have no skill as a farmer, but I am a lover of country life, and I hold my neighbors in high regard. I study their ways, I learn their virtues, and I learn their faults. Did time permit, I would speak of their errors and of many serious mistakes which they make in the management of their affairs. I may do so on some other occasion. We have many things to learn and many methods to improve, before farming will become what it ought to be in this country.

To make clear the character of our continent, its fertility, extent and climate, strong terms have been used, which may seem to be exaggerations, calculated to mislead in some respects. The future will show their full influences. It is not probable we shall have, during the current year, such markets abroad as those which have given us wealth and business activity during the past six months. There is danger that these will be followed by a reaction in the prices of all kinds of property; that they have been carried above points at which they can be sustained. Prudent men will be cautious for a time, but the enduring facts set forth will govern in the end, and work out their results. We do not regard them in any spirit of ill-will or rivalry toward other countries. We hope and believe our prosperity will benefit all nations; that it will check abuses in Europe; teach monarchs that they must study the welfare of their subjects. The mingling of all European lineages on our soil will soften prejudices and lead the people of other countries to look more kindly upon their neighbors. We have been enriched by full harvests here and by their failure elsewhere. But these failures, while they may help us, are subjects for deep regrets. If in the season before us, all the fields of the world shall yield unusual abundance, we will rejoice and thank God for his bounties to our fellow men in all quarters of the earth.

NOTE.—I am indebted to Dr. Homes, of the State Library, for a list of the cities of France, Germany, Austria and the United States. As the enumerations of their populations were made at different times, an exact comparison cannot be made of the number of their citizens. With regard to those in the United States, their growth is so much more rapid than that of towns elsewhere that the census made this year will show that the number with more than 30,000 people should be much larger than I have stated in the following table.

*TABLE showing the number of cities in the United States, France, Germany and Austria with populations of thirty thousand and upwards :*

Cities with a population of over	Census of 1870. United States.	Census of 1876., France.	Census of 1875. Germany.	Census of 1870. Austria.
1,000,000.....	One .....	One .....	One .....	
750,000....	Two.....	One.....	One.....	One.
500,000.....	Five .....	One .....	One.....	One.
250,000.....	Eight .....	Three .....	One.....	One.
150,000.....	Thirteen .....	Five .....	Four.....	Three.
100,000.....	Nineteen .....	Nine .....	Nine.....	Three.
75,000 .....	Twenty-three ..	Eleven .....	Nineteen ....	Four.
50,000.....	Twenty-nine..	Twenty-nine.	Twenty-five..	Ten.
30,000.....	Forty-five.....	Forty-one....	Thirty-six ...	Fifteen.

With regard to those of the United States, the census of 1870 has been used, except in cases where later reports have been made.

In 1876, the population of France was..... 36,905,788  
 In 1875, that of Germany was..... 42,757,812  
 In 1869 that of Austria was about ..... 36,000,000  
 That of the United States is now about..... 50,000,000

While our numbers are the largest, it must be borne in mind that our great cities, and most of those of a smaller size, are situated in the northern half of the Union, where the winters are very cold and the summers very hot; that they are supported by States whose united populations are not equal to those of the above-named European countries.

Great Britain is not brought into this statement, as no city can compare with London. Leaving that and New York out of view, our cities are larger and more numerous than those of the United Kingdom.

## THE LUNG PLAGUE—OUR DANGER AND THE REMEDY.

Address before the Society, January 21, 1880, by JAMES LAW, M. R. C. V. S., Professor of Veterinary Science in Cornell University, Consulting Veterinarian to the Society, and Chief Veterinary Officer of the State Cattle Commission.

**MR. PRESIDENT AND GENTLEMEN**—The honored and eloquent gentleman who has presided over this Society for the past year has just depicted in glowing terms the mutual advantages to Europe and America of the abridging of the Atlantic voyage, of the liberal supply of our breadstuffs and meats to Europe, and of the constant accessions of the life's-blood of Europe, of its bone and sinew, to

cultivate our waste lands and swell our harvests. We have been so charmed by the glowing tints that I fear it will prove a thankless task, as it is certainly an unpleasant one to call attention to a dark shade in the picture. While steam has bridged the ocean, brought Europe to our doors and conveyed our surplus products to the old world, multiplying our stores and scattering blessings broadcast on both continents, the outcome has not been an unmingled good, though the evil may be insignificant in proportion.

We have drawn upon the Old World not only for our human population but for all our different classes of farm animals, and to-day all our domesticated cattle are but the descendants of imports from Europe. In this way we have obtained shorthorns, Herefords, Ayrshires, Holsteins, polled Angus, Jerseys, Guernseys and Alderneys, whose descendants of to-day are not to be excelled on the face of the earth, but with these splendid imports we have introduced a less welcome accession in the most insidious and most dangerous of all the plagues of cattle—the Lung Plague.

If less desirable this has not been less prolific than our other acquisitions from Europe. Landed in Brooklyn in 1843, in the body of a cow from an English ship, this pestilence has multiplied its victims and conquered new territory until six States have been darkened by its baleful shadow. From one, its victims have risen to hundreds and thousands, and year by year the area of its prevalence has extended, giving a guarantee, all too certain, that time alone is wanted to wrap the whole of this vast and productive continent in its deadly covering.

The European and North American continents, though so unlike in many respects, have this in common: that each has in its central area a vast extent of pasture land untilled and unfenced, covered by countless flocks and herds which roam at large and mingle freely day by day. In Europe and Asia these open pasture lands have from time immemorial been the permanent home of a number of animal plagues, which, once introduced from whatever source, have spread from herd to herd and have become only more generally diffused from year to year. The continual accession of young and susceptible animals by birth has served to furnish a constant supply of raw material to work upon; and if at any time a herd has escaped infection for a time, or if a herd has been brought from outside for the improvement of the native stock, its members have been speedily contaminated by mingling with the infected cattle on the steppes, and have suffered all the more, that they were now in greater part susceptible to the infection. On these great uninclosed plains, therefore, these plagues have defied all attempts of the individual and the government to extirpate them, and from these steppes, western Europe has derived almost all her animal plagues. While the rinderpest stands at the head of the deadly list of steppe plagues, followed at no long distance by the Siberian Boil Plague, there prevail continually the more insidious but hardly less deadly lang plague, and the ruinous, contagious eczema and sheep-pox.

Against these Germany and Austria can only protect themselves by rigidly guarding their frontiers, by a military patrol pacing every foot of ground day and night, and compelling all stock to undergo examination and quarantine. By a quarantine of a week the more rapid fevers (rinderpest, contagious eczema, foot and mouth disease, sheep-pox, etc.) are shut out, but the more insidious lung plague with its long period of incubation, and its equivocal chronic cases has continually escaped this vigilance and therefore while the rinderpest and sheep-pox have appeared in western Europe only at long intervals and almost altogether in connection with great wars which broke down the barriers, lung plague has prevailed without intermission. The magnitude of the trade was incompatible with a quarantine of 90 to 100 days, and without such a quarantine the plague could not be excluded.

The open grazing lands on the west of the Mississippi are the exact counterparts of the steppes of Europe and Asia, as far as regards the trade in cattle. They are at the source of the traffic and from thence cattle are being constantly sent in thousands and tens of thousands to the middle and eastern States. Were a genuine plague to originate there, it would speedily spread through the whole unfenced territory, increasing its area with each succeeding year, but it would also pollute all the streams of the traffic and diffuse the deadly infection over all the middle and eastern States. The stock sent to supply the mining cities in the Rocky mountains would carry out the infection to Dakota, Wyoming, Utah and Nevada, and finally it would reach Washington, Oregon and California, and the whole Union would fall under the sway of the scourge.

Were such a plague to have but a short incubation of less than seven days, it might be possible, at great expense, to guard against it at the frontier of particular States; but even this would entail the accumulation at certain points (Buffalo, Chicago, etc.) of 20,000 head of cattle and upward at all times, seriously interfering with the trade, baffling all the calculations of the western shipper as to the probable markets, and rendering his occupation in the highest degree risky and uncertain. Were such a plague to bear the long incubation of the lung plague, the needful quarantine of ninety to one hundred days would be absolutely prohibitory, and either the trade must stop or the infection must spread over the entire East.

But Providence has endowed our western stock ranges with no such plague-generating fruitfulness. The soil, surpassingly rich in its vegetable products, has for ages supported vast herds of the bovine family (buffalo), but on no occasion has it produced the germ of any plague comparable to the European cattle plagues. Had this been once generated on these open plains, it would have been perpetuated as surely as it has been, under similar conditions, in Asia, Europe, Africa and Australia. The infection of the first two is too ancient to be matter of record, yet the plagues are as widespread to-day as they were before the dawn of history. The infection of South Africa and Australia is but a thing of yesterday

(1854 and 1858, respectively), yet there, too, the infection continues to prevail and shows no sign of abatement.

We already harbor this the most insidious of all cattle plagues, and it is only a question of time or accident when it shall reach our open grazing lands. If it spreads only as it has spread in the past, by slow advances from farm to farm, it will be a number of years ere this is brought about. It is opposed by the great current of cattle traffic; and, were there no returning stream, we might for a time rest secure in the trust that our eastern seaboard and inclosed farms only would suffer. But with the rapid development of the cattle interests of the West the demand increases for better blood. The long-horned and bony Texans no longer adorn our markets, which are filled with the best of grades instead. To produce these, the eastern and European herds are depleted, and there is every reason to fear that a thoroughbred sire, sent out from New York, New Jersey, Pennsylvania, Maryland or Virginia, may carry out the infection to those western ranges, and secure its perpetuation and general diffusion over the continent.

The menace of this is constant, and becomes greater every day, as the plague becomes more widely extended.

While it was confined to the west end of Long Island, New York city and Jersey City, there was little risk of the passage of cattle from the infected regions to the West. The herds about those cities were simple dairy herds, composed of common stock, which were far cheaper in the West than where they were, and while these herds were being constantly maintained by new accessions from the West, they never furnished to the West any animal in return. But now that portions of six separate States are involved, the infected area incloses a great many valuable thoroughbred herds, which are constantly furnishing sires to improve the blood on the plains. As the infected area increases, the greater is the number of thoroughbred herds within this area, and the greater the likelihood of one such herd that has become infected furnishing a sire which shall carry the infection to our unfenced ranges. Many of our thoroughbred herds have been infected, and some now are. Blood gives no immunity. A short-horn cow carried this infection to Australia and infected the boundless pastures of that island continent. A Dutch bull conveyed it to the Cape of Good Hope, whence the whole of South Africa became infected. Four Holsteins infected the State of Massachusetts, and cost that commonwealth \$78,000 and five years' work to root out the pestilence. Ayrshires infected Norway, Sweden, Denmark, Schleswig and Oldenburg. Almost all the non-European countries that have been infected have been so by thoroughbred stock. That thoroughbred stock has not already infected our western herds is little short of a miracle, and no folly can be worse than to count upon the indefinite continuance of this immunity. All our domesticated cattle are descendants of the imported stock of Europe, yet we escaped this plague until 1843. All the cattle of Australia are the progeny of imported

cattle, yet they escaped the contagion until 1859. It is the one infected importation, after decades or centuries of harmless importation, that fixes the scourge on a new land and blights its herds. The likelihood of the infection is increased in exact ratio with the great development of the live-stock industry in the West, the consequent demand for high-class sires, and the number of herds in the infected area at the East from which such sires can be drawn.

In the second place, the danger of infection is increased in ratio with the infected area, because such area then contains a greater number of miles of rail, more railroad cars are used in conveying cattle, and cars used in this way are more likely to be used without disinfection for the conveyance of the thoroughbreds westward. This remark about cars applies with equal force to yards, loading banks and other places for the accommodation of cattle about to be shipped.

In the third place the increase of the infected area increases the danger that hay and other fodder that has been stored in the same barn with sick stock, and which on the death or sale of such stock has been thrown on the public market, shall be purchased and used for the thoroughbred cattle on their journey westward, thus conveying the infection to them and sending it out to the plains. Still more, the increase of the infected area renders it more probable that an attendant on sick cattle in the East thinking to better his condition, may pack his trunk with the clothes saturated with contagion, may take a three days' journey out to the plains and there find employment about a herd, which may thus become infected and the starting point for the permanent infection of the continent. It is a matter of common occurrence with us that an infected building will convey the disease to new stock placed in it, after it has stood empty for weeks and months. If a stable will retain its poisons in an active form for three months, is it to be expected that clothes will become disinfected while packed in a close trunk for three days?

Other possible channels might be named but these will suffice as illustrations. Every day increases the danger of our general infection and therefore every day renders the demand more imperative that this old-world plague should be driven from our shores.

#### WORK IN NEW YORK IN 1879.

In the past year the Empire State has taken a laudable position on this matter. On February 6th I was summoned by a telegram from Governor Robinson to proceed to Kings and Queens and determine whether the contagious pleuro-pneumonia existed among the cattle of those counties, and if so to what extent. I arrived in New York on the 7th, examined a number of herds and on the 10th reported the disease very prevalent in and around Brooklyn. General Patrick was at once appointed to take charge of the work, with myself as professional counsel and assistant. Measures were

taken to circumscribe the infection and stamp it out, and as new developments showed that the disease had already gained a wider extension than at first appeared, our work was carried outward until we were finally dealing with it in the counties of New York, Kings, Queens, Suffolk, Richmond, Westchester, Putnam and Orange. Reports of outbreaks in more distant countries led to investigations in those of which I may specially name, Dutchess, Columbia, Rockland, Delaware, Oneida, Herkimer, Chenango and Tompkins, but in none of those counties was the lung plague found to exist. The complaints in all these cases were of another nature, though in a number of instances the lungs were diseased either from the presence of lung worms or of tubercles.

Not to weary you with a particular account of our work I may say that the inspectors have examined 40,000 head of cattle, an amount of work which may be appreciated when I say that each had to be tested as regards pulse, breathing, temperature, and above all, by the percussion and auscultation of the chest. The need for great care and accuracy will be appreciated when I say that animals that have apparently recovered and that any stock-man would suppose to be perfectly sound, usually carry for months, or even for a year, encysted masses of dead lung, yet show scarcely any outward symptoms of this state of things; they milk well, and may even lay on flesh; the skin may become loose and supple, and yet those animals are often found to be the starting point of infection in a herd into which they may be brought. No such animal can be safely preserved and therefore the examination of each must be so thorough as to detect all such solid infecting masses, even where the general health appears excellent.

In carrying out our work we have had to kill and give indemnity for 521 head of cattle, we have held 220 herds under quarantine, we have eradicated the disease from three infected counties, and have all but accomplished the same for four more. There are still five infected places in New York city, six in Westchester, one in Putnam and a number in Queens, but only in the vicinity of Brooklyn.

In Brooklyn and suburbs we have at present thirty-five herds in quarantine aggregating 600 head of cattle, of which at least 100 head ought to have been slaughtered, but that we had no means of indemnifying the owners.

With a sufficient appropriation we would be but a short time now in clearing all of New York, excepting Brooklyn and suburbs. Then if Brooklyn and the adjacent parts of Queens are put under the same rule with New York the work will be most effectively accomplished then as well. I need not try your patience by a full outline of the methods referred to. The primary points are the reception of stock from districts known to be sound, and from none others, in designated inspection yards; the movement of such stock, after examination and by permit, to the stables of the dairy-men who buy them; the stoppage of all movement from any stable excepting to the slaughter-house and that on permit, the cattle being

inspected after death as well as before ; the slaughter of all sick cattle and the thorough disinfection of the premises.

These measures, with many other minor ones, have been in force in New York city since July first, and had reduced the infection in that city to little over half a dozen herds by October first. We were not only delayed in Brooklyn for lack of means, the Brooklyn aldermen opposed our work in various ways and to a serious extent. They passed an ordinance authorizing the pasturage of cows, *as* commoners, on unfenced lots, in direct violation of the orders of General Patrick acting for the governor. To prevent policemen and pound masters from enforcing the law, they next abolished the pounds. When delinquents were brought before police magistrates for violation of General Patrick's "pasturage order," the cases were dismissed and the police were sometimes censured. Alderman Powers went further and gave a permit to move cows in the city limits in defiance of the law.

In view of these facts it was impossible, with the means at our command, to secure a perfect control of the movement of cattle in Brooklyn, and as a liberal expenditure of money in that city would have produced very little good as compared with its outlay elsewhere, the work in Brooklyn since August first has been little more than the quarantining of herds and the regulation of the movement of cattle as far as circumstances would permit. The results in the two adjacent cities, about equally infected last spring, are highly instructive and encouraging. New York has now but five herds in quarantine and has furnished but five cases of lung plague in the past month. Brooklyn has thirty-five herds known to be infected, containing nearly 100 animals that should have been slaughtered as affected with lung plague.

A few weeks will probably suffice to root out the disease from all our infected districts outside Brooklyn and its suburbs, and with sufficient means these too should be cleared by 1881.

#### WORK FOR THE FUTURE.

But suppose this were accomplished, what is our prospect ? Can we fold our hands and congratulate ourselves on our escape ? Assuredly not. With New York as the great *entrepôt* for cattle, not from the West alone but from New Jersey, Pennsylvania and Maryland as well, the suspension of our vigilance for a single day would assuredly allow the reinfection of our herds, and if it were suspended for a week it may be safely asserted that all our previous work and outlay would be undone.

1st. New York market has been so long closed against cows from the States south that the price is now higher in New York city and Long Island than in New Jersey and Eastern Pennsylvania. Every day we have applications to allow the introduction of cows and store cattle from New Jersey and Pennsylvania, and all sorts of influence are brought to bear to secure this end. Putnam and Westchester



are equally in need of cows with New York, and if the restrictions were removed would be speedily filled up by unscrupulous dealers who would buy at a low figure out of the infected herds of New Jersey and scatter the purchases in the adjacent counties of New York. Some men of this stamp do not hesitate at means, and the moral obliquity which will allow them to purchase infected animals at a knacker's price and sell them for sound and fresh milch cows would also permit them to ship such animals to Fishkill and introduce them into Putnam and the counties south as western animals.

Even with our control of New York we have had much of this to contend with. Dealers from New Jersey have smuggled a few cows across from Jersey City in a boat load of fat steers, and in the unsatisfactory condition of Brooklyn have run them into the city and suburban dairies. We have detected several instances of this kind and quarantined the herds into which the smuggled cattle have been introduced. This thing cannot be done in New York city, nor could it be in Brooklyn if the same measures were once enforced there. But the traffic would be open and constant if our restrictions were removed, and the re-infection of our lower counties would be at once speedy and complete.

If, therefore, the work of extermination were to be accomplished in the State of New York to-morrow, it would still be requisite to maintain a staff of inspectors to guard against re-importation, and no less needful to restrict all movement in our lower counties to such animals as were accompanied by special permits, so long as the disease is harbored on the continent. If the individual States should refuse or fail to stamp out the plague, we can only be saved from a renewed invasion by the maintenance of such a constant watch, or by the United States stepping in and carrying out the work for the good of all.

2d. It has been decided by the United States supreme court in Missouri that any State law forbidding the introduction of cattle from a neighboring State on the ground of suspected infection is unconstitutional. Here is another barrier to the protection of one State against infection from its fellow. If we seek to protect our frontier against animals that bear the seeds of this pestilence we are at once barred by the law, and we must allow the pestilence bearers to enter our own territory and then deal with them as we think best. To keep infected animals out of the herds it will therefore become necessary, for a State acting for herself, to keep a constant watch on her whole frontier, and to maintain a great series of quarantine yards and a most expensive staff of officials if she would succeed. But the protection which cannot be procured by a State for herself can easily be accorded by a Federal authority which knows no State lines and to whom the herds and dealers of all are alike known and alike amenable. This is a matter of inter-State commerce and as such rightly comes under the jurisdiction of the Federal power.

3d. Independently of the legal prohibition the limitation of the sanitary work to our State must render all control of inter-State cat-

the traffic either utterly useless or ruinously expensive. If the sanitary officers admit cattle from the neighboring State on a simple examination, they will inevitably admit many from infected herds and many in which the disease is still in the incubative stage, and that will show no signs of illness for two or three months to come. They will also fail to detect a certain number of those that carry in their chests the smaller masses of infecting material, and thus infection will be spread in spite of the great expense and trouble. If on the other hand they quarantine for three months all cattle crossing the frontier, the expense will be absolutely prohibitory, and smuggling will flourish as in all such cases.

For this again the action of the Federal authority is the most effective cure, for knowing no limit but those of the Union they will go to the infected herds everywhere and by promptly stamping out the pestilence will do away with all need for the complicated and costly machinery necessary to guard the border of each State, and will at the same time abolish smuggling by doing away with the contraband article, or so bonding it that it shall be held until it shall have furnished the requisite guarantees.

4th. With action by single States no guarantee can be given that cattle brought from a neighboring State have come out of a sound herd. But under Federal action and with a supervision for six months of the herd from which the stock has been drawn, the most perfect guarantee can be given and all need for expensive and prohibitory quarantine at the border will be done away with.

5th. If it is claimed that a proclamation by the president quarantining an infected State until it shall have stamped out this disease from its territory, and the enforcement of this quarantine by United States marshals aided by all good citizens, will sufficiently protect, I answer that the idea is delusive. Take the long frontier line between New York on the one hand and New Jersey and Pennsylvania on the other, and consider for a moment whether, with our constitution and habits, it is possible to maintain a sufficient watch day and night along such a frontier. To propose such a measure is to condemn it. A partial guard would be but a farce and would give but a fancied security without any real protection. In all such cases, there would soon be found persons in collusion on the two sides of the line, one of whom would purchase the cheap infected cattle and watch his opportunity to run them over to his partner in the next State, who would either offer them for sale on his own place, or run them off to a distance and dispose of them to parties who would be less liable to know the seller and come back to him with unpleasant eliminations when months later the cattle began to sicken. All this would be obviated by having Federal officers dealing with the infected herds in all States alike.

6th. When official authority is bounded by the State, cattle run out of infected herds, or from which there is reason to fear infection, are free to be conveyed where the owner will the moment they have crossed the boundary, and the State officials who would gladly have

detained them for the protection of their neighbor, are set at defiance and must look on helplessly. Somewhat of this nature were the escapades of the imported Holstein herd of Messrs. George Brown and Son of Aurora, Illinois, and the herd of Mr. Culbertson of the same State, which owing to some unexplained lapse at the Custom House went to the West without detention or quarantine, and were immediately offered for sale, there being no authority in Illinois to impose any prohibition or restriction.

7th. Finally as regards importations the United States alone can impose a uniform and effective rule. Leave the matter to the different States, and we shall continue to find certain herds admitted like the Illinois cattle referred to, without any detention at all; others will be kept but eight days as were imports into Canada up to the time of our closing our frontier against Canadian stock; and still others, like the Jerseys at Philadelphia, will be released after a quarantine of thirty days. A system, by the action of which we find examples like these alongside of the three months quarantine imposed in New York, is eminently unequal and unjust, and must sooner or later come to an end through the indignant remonstrances of the sufferers.

But I have said enough. If I have not already convinced you of the necessity for a uniform and common action in all the States, I despair of doing so by any thing further that I can say. This plague, foreign to our soil, may be compared most aptly to an enemy who has landed on our shores, and who aims to lay the whole country under contribution and to reduce it to subjection. This enemy knows no State limits, and respects no border lines. He seizes on the points of vantage, fortifies them strongly, and, disarming the populace and spoiling them of the fruits of their labors for the support of his soldiery, he makes every new accession but an additional arm of strength by which he may reach forward to subjugate the territory beyond. What would be thought of the counsel that would advocate that the opposition to such an invasion should be circumscribed by State limits? That we might, if we chose, drive the enemy from New York, but we must not follow him into New Jersey or Connecticut. That if Delaware or Virginia chose to submit to the invader, and give him a stronghold whence he could raid, plunder and subjugate the States adjacent, we must each hide our time, let each State protect its own interests, and let none interfere with the common enemy until he has entered the territory of that particular State. Yet the plague is no less dangerous and relentless; no less oblivious of political boundaries; no less inimical to the whole nation; no less tenacious in its grasp upon new territory, and must be no less disastrous to our finances when it shall have conquered the country, and when we shall see scores of millions annually forcibly taken from the hard-earned gains of our people. Of the two the plague is incomparably the more dangerous, as it lurks in each new region for months unseen and unsuspected, and while an invading army can only hope to subjugate a free and loyal people

by moving in overwhelming masses, the plague may blight our whole cattle industry if but one infected beast, in the guise of a sound and most desirable sire, is transported to the far West.

If we are ever to be permanently freed from this pestilence, we must secure a concerted uniformity of action, and such action can only be had through the intervention of the Federal Government. The first requisite is that the needful outlay must be met by the national exchequer. This is the least that can be asked, as the plague is a far greater menace to the vast grazing regions of the South and West than it is to the comparatively restricted infected area in the East.

This measure alone may be sufficient to secure a prompt and effective action in each infected State, and it would only be requisite to have a Federal Sanitary Commission to oversee the work, to audit the bills and to authorize payment only when the work was properly conceived and efficiently carried out, and we might soon hope to see the last of the pestilence. But in view of the apathy of certain States any bill providing for this should have a clause enacting that when a State declined to take action, or to make such action efficient, it should become the duty of the United States Government to step in and do the work for the general weal.

This is not a subject that we can afford to deal with leisurely. It must furnish no sinecures, nor set of permanent offices to be maintained year after year for the support of favorites. The work must be active that relief may come early, and any partial or ineffectual measures must be speedily superseded by others more stringent and effective. It is a great work that may cost the nation \$1,000,000 or \$2,000,000, but the outlay will be fully warranted in the warding off of a pestilence, which if left to itself may cost the country a thousand millions before the end of the present century.

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## REPORT ON SOME INJURIOUS INSECTS OF THE YEAR 1879.

[Presented to the New York State Agricultural Society at its Annual Meeting, January 21, 1880.]

By J. A. LINTNER.

Recognizing, as I do, the great importance of the study of insects as a means of mental discipline to the young, an unfailing and ever-present source of interest and instruction in more advanced years—as a duty resting upon every one to acquaint himself with the common objects with which he is surrounded, and, lastly, the incalculable economic value of the study of the myriad forms which almost seem to hold a place in nature antagonistic to us in our struggles for existence—I take pleasure in being able to report

marked progress in entomological studies during the past year. If, gentlemen of the New York State Agricultural Society, you who are more directly exposed to the pecuniary loss resultant from insect depredations may perchance feel that your interests have not secured their proper consideration in these studies, I beg leave to remind you, that before the study of economic entomology can be properly and most advantageously prosecuted, much preliminary work remains to be done. The material must be sought for, collected and placed in proper hands. Careful study of allied forms, which may have been described in this country or in Europe, must be made. The hosts of previously unknown forms are to be described, and their respective assignments made to their proper places in systematic arrangement.

In Europe — as the result of a more general attention to natural history, the broad recognition of its value, and the liberal aid extended to this department of study through private munificence as well as government patronage — much of this preliminary work has already been accomplished. The discovery of a new insect is comparatively rare. Nearly all the known insects have been described, and pictured, in accurate figures and faithful coloring, in all their stages when the same are known, even of those microscopic but surpassingly beautiful Tineid moths, whose entire development, from the egg to the perfect insect, is perfected within the circumscribed limits of the inner tissue of a single tiny leaf. As the direct consequence of this knowledge of insect forms — of descriptive entomology, as it is termed — economic entomology in Europe is very far in advance of its stage of advancement in this country. In all the principal continental universities, it has prominent place in the scientific course of study, under charge of eminent professors, occupying liberally endowed chairs. The students have access to collections, the extent and value of which dwarf those of our institutions. Years ago, a single collection of Coleoptera (beetles), in Munich, could boast of its 25,000 named species; and no longer ago than the date of this enumeration, when, as it may be inferred, considerably less was known of insects than at the present, one of our writers, in a volume purporting to impart instruction in natural history, gravely informs his readers that "there are two kinds of beetles, a black one and a red one." In contrast with such ignorance, it may be stated that our last list of North American coleoptera, published six years ago, gave the names of 7,450 species.

It is very encouraging that so much attention is now being given to insects in our country — quite as much, it is believed, as to any other department of natural history. The number of those engaged in its study is rapidly increasing. At the last meeting of the American Association for the Advancement of Science, a list was reported, to our great surprise, of 835 persons in the United States and Dominion of Canada who are engaged in entomological work. A most gratifying demand is springing up for works treating of insects, for private study, and for instruction in our institutions of learning.

The several serial publications exclusively devoted to entomology are well sustained. The Smithsonian Institution at Washington, in pursuance of the expressed objects of its organization — the extension and diffusion of knowledge among men — is continuing its series of entomological volumes, and has during the past year given us a catalogue of the Diptera (flies) of North America, embracing about 2,500 species, which has been years in preparation; and, as illustrating the greater progress which our European friends have made in their studies, to which I have above referred, I may state that, for the more satisfactory completion of the work, the author, Baron Osten-Sacken, found it desirable, for the last three years, to take up his abode among the collections and books and scientists of Heidelberg, in Germany. And, last to which I will refer, the United States Entomological Commission, established by our general government for the special investigation of the Rocky Mountain locust, is still continued, having had the sphere of its operations extended to include other of our more injurious insects. It is now in the third year of its active operations, and, notwithstanding the valuable results which have been already secured by its labors, the vast field opening before it seems scarcely to have been entered upon.

Did time permit, I would invite your attention to a statement of the probable work in descriptive entomology yet to be done throughout our broad extent of territory, before we are prepared to present even an approximate enumeration of the insect forms with which we have to contend, and whose transformations and varied habits it is the province of the practical entomologist to study and to record. But the brief time allotted to me will scarce suffice to invite your attention to a few of the interesting insect depredators to which my attention has been called during the past year.

#### THE CLOVER-SEED MIDGE — *Cecidomyia leguminicola* Lintn.

In the paper which I presented to your society at its last annual meeting, I described and gave some account of a new insect-pest, under the name of *Cecidomyia trifolii*, which was injuring to a great extent the clover crop, in some of the western counties of our State. A description of the larval form of the insect, under the above name, was published in the *Canadian Entomologist*, for March, 1879. Soon after the above publication, I learned that the name which I had selected had already been used in Europe, by Franz Loew (*Verhandl. Zool. Bot. Gesell.*, Wien, 1874, vol. xxiv, p. 142) for a species which he had discovered within a leaf of *Trifolium pratense*. Accompanying the description of the larva, pupa and perfect form, is a figure of the deformation of the plant. In addition to this, two other species of *Cecidomyia* possibly have been detected in Europe. Breini, in his *Monograph of the Cecidomyia*, states that in a locality where he had found *Cecidomyia ranunculi* on *Ranunculus bulbosus*, he also observed on the leaves of the red

clover, *Trifolium pratense*, small cornucopiæ similar to those on the *Ranunculus*, but less regular, as in some of the leaves only the tip was rolled, while other leaves were folded like a pod. He believed them to be only a varietal mode of occurrence of the *Cecidomyia ranunculi*, but was not able to obtain the perfect insect.

The other form is noticed by Perris, in *Ann. Soc. Entomolog. France*, 1870, p. 179, where he mentions the occurrence of Cecidomyous larvæ in the tips (*extrêmes tiges*) of *Trifolium subterraneum*, of which the imago was unknown to him. Franz Loew, in a subsequent notice of these larvæ (*Wien Z. B. Gesell.*, 1876, p. 92) suggests that they may have been only inquilines, and that the deformation described by Perris may have resulted from the operations of Acari.

It will be seen from the above that the species of *Cecidomyia* which are known to infest the clover in Europe are of the kind which produce deformation in the plant, and consequently are quite different in their operations and habits from our species, which attacks the forming seed and prevents its development.

In consequence of the preoccupation, as above stated, of the specific name at first given, I proposed in a paper published in the *Canadian Entomologist*, for July, 1879, the name of *Cecidomyia leguminicola* for the species, the larva of which lives within the clover legume.

When this insect was brought to your notice a year ago, the larva only was known to me. I then stated that from some larvæ which had emerged from clover heads and entered the earth for pupation, I hoped shortly to obtain examples of the perfect insect. Anticipating possible failure in carrying them safely through their pupation (which proved to be the result) I made application to a member of the society, Mr. R. J. Swan, of Geneva, N. Y., who at the annual meeting had mentioned the occurrence, in very large numbers, of the larvæ in a clover field upon his farm, asking that some of the surface soil from the field might be forwarded to me.

In compliance with my request, a small box of the earth and clover roots (of about six inches cube) was sent, and received by me on the 2d of June. The contents of the box were spread out in a glass-covered case, and on the following morning, a pair of the minute, but beautiful little creatures when examined with a lens, were found, in copula, in the case. Additional examples — twenty-five in all — continued to emerge, until the 27th of June. Had the earth been procured at an earlier date, many more specimens might have been obtained, and it would have been an interesting result, toward a knowledge of the abundance of the insect, to have ascertained how many individuals would have been given out from a square foot of earth.

The earliest date of the appearance of the midge is not definitely known. The mature larvæ which I have taken from the heads of clover early in June must have been the progeny of insects abroad as early as the 1st of May. It is probable that the eggs are depos-

ited as soon as the blossom has sufficiently advanced to offer a proper place for their reception. The statement made by Prof. Riley, that the flies begin to emerge in the month of September,\* would indicate two annual broods as is the case with the Hessian fly† (*Cecidomyia destructor*) and perhaps with the wheat-midge (*Diplosis tritici*).

Simultaneously with my observations on this insect, Prof. Riley, of the United States Entomological Commission, was engaged in its study, as I subsequently learned — his attention having been drawn to its presence in Western New York, in August of 1878. A communication in relation to it, with enlarged figures of the insect, was given by him in the *American Agriculturist* for July, 1879. In advance copies of the *Report of the Entomologist* (published August 22d, 1879) extracted from the *Annual Report of the Department of Agriculture*, for the year 1878, the figures are reproduced, and descriptions of the insect in its several stages, given. No important facts in regard to its habits are communicated.

Soon after my publication of the discovery of this insect, Prof. W. H. Brewer, of Yale College, Conn., gave me the information that his father, Mr. Henry Brewer, of Enfield Center, Tompkins Co., N.Y., had been an enthusiastic grower of clover and clover seed as far back as he could remember, and that many years ago, certainly before 1848, it had been known to him that an insect attacked the clover, which hatched out a fly, of small size and slender form — all that could be recalled of it. The clover heads were not affected externally, in their appearance, by the insect. It was believed, at the time, that the depredating larva existed within the seed. On two occasions, once before 1848, and later, between 1851 and 1855, Prof. Brewer hatched out flies, and sent them to Albany, either to the *Entomologist* or to the *Country Gentleman*, but nothing was learned from them.

From the above statement, I was led to believe, and somewhat hastily published my belief (*Canadian Entomologist*, vol. xi, p. 124) that there could be but little doubt that the above insect was identical with the newly described clover-midge, and that it was quite an interesting fact that the first notice of the species, so far as known, came from a county (Tompkins) which was suffering more from its depredations at the present time, than any other portion of the State.

Additional correspondence with Prof. Brewer has shown me that the insect pest of clover seed of thirty years ago could not have been our present clover-midge. He makes the following statement: "When the ripened heads of clover, after having been cut for seed, were rubbed in the hand to separate the chaff (calyx) from the seeds, some seeds would be found which were not so plump as others — of a more brownish color, and lacking the luster of the normal seed. A needle could be thrust through them, disclosing,

\* Report of the Commissioner of Agriculture for the year 1878, p. 251.

† Dr. Packard suggests the possibility of a third brood in New York.



as we thought, a very small worm within. On one or two occasions, when such seeds or clover heads, believed to be infested, were kept in a vial with gauze tied over the top, the minute flies appeared after a time."

Mr. Henry Brewer is quite positive of the difference of the two insects — the one, of years ago, feeding upon the mature seed, and the recent one, preventing the formation. The operations of the latter were first noticed by him six or seven years ago [1872 or 1873]. He represents it as a great pest, nearly destroying the crop, and further states that the "little kind" of clover is more affected than the "large kind" [varietal distinctions which have long prevailed in that portion of the State]. What the insect preying upon the mature seed could have been, we are at a loss to know. It probably failed to receive scientific study, and having had its cycle, may have passed away, perhaps to reappear at no distant day. Possibly the larvæ may have been those of some species of Coleoptera (beetles), and the "small flies" observed in the bottles, hymenopterous parasites preying upon them, and eventually exterminating them.

While the only serious injuries reported of this insect are from the western portion of the State of New York, it is, in all probability, quite generally distributed throughout the State, and extends, at least, to adjoining States. On the 1st of July of last year (1879), examples of the larvæ were found by me on clover heads gathered on Mt. Equinox, Vermont, at an elevation of 2,500 feet above tide. On July 5th — a late period for a first brood of larvæ, mature specimens were taken from heads of *Trifolium pratense* growing within the city of Albany, bordering the sidewalk of Western avenue. A large number of the heads of white clover (*Trifolium repens*), gathered at the time, gave me no larvæ, nor indications of their depredations. My knowledge of the capture of the midge, at large, is limited to a single instance, where an example was picked up from the deck of a steamboat on the Hudson river, near Castleton, N. Y., on the 16th of July.

As showing the serious aspect which the operations of this insect is assuming, I quote, by permission, from a report presented the present month to the secretary of the State Agricultural Society by Mr. Wm. W. Stacey, president of the Seneca County Agricultural Society. He writes: "The crop of clover seed in our county is an entire failure, owing to the ravages of an insect very similar to the wheat-fly so destructive to that grain in this section some years ago, and which attacks the head, feeding on the juices of the green seed. This insect has been noticed in the clover for some few years past to some slight extent, varying in localities, but this year, has developed to an alarming degree all through this and the adjoining counties."

The clover-seed midge, in general form and external character, resembles the wheat-midge, *Diplosis tritici*, but it is readily distinguished from it by its color, — its wings being dusky from their

pubescent covering of short, curved, blackish hairs, its abdomen red and marked on each ring with some black scales arranged in a segment of a circle arched in front, its thorax superiorly and head red, and its legs brown. The wheat-midge is of a pale yellow or orange-yellow color, the size of the female is twice that of the clover seed midge, and its male is proportionately smaller than that of the latter, in which the difference in size of the sexes is not very marked.

#### THE CLOVER-ROOT BORER — *Hylesinus trifolii* Müll.

Another serious insect pest of the red clover has been brought to notice during the past year. The attention of Prof. Riley was first called to the ravages of this insect, in the fall of 1878, in some clover fields in Branchport, Yates county, N. Y. Upon visiting the locality, he found the roots of the clover so infested by the insect, and destroyed to so great an extent, as to prevent the cutting — the plant pulling out and gathering in windrows before the mower. In the infested fields, not a single plant entirely free from the insect could be found. The roots, in many instances, had been completely severed from the stem, and the stems were often found to have been bored for some distance above the ground.

The insect proved to be a small beetle, belonging to the destructive family of Scolytidæ, which comprises some of the most formidable enemies of arboriculture both here and in Europe, as the species of *Scolytus*, *Tomicus*, *Hylastes*, etc. It was identified by Prof. Riley as *Hylesinus trifolii* Müll — a European species described by Müller in 1844. Its injuries to *Trifolium pratense* in Europe, and especially in Germany, had long been known, where they were of the same nature as those observed in Western New York. In all probability it had recently been introduced in this country, for it was not known to Dr. Le Conte at the time of the publication of his *Synopsis of the Scolytidæ*,\* in 1868, in which he records ten other species of the genus *Hylesinus* from various parts of the United States, nor is it included in the *Crotch Check List of Coleoptera*, published in 1874.

The operations of the insect, as described by Prof. Riley, are as follows: The beetles emerge from the ground in early spring, and pair. The female eats a cavity into the crown of the root, in which she deposits about a half-dozen eggs. The larvæ hatch in about a week and burrow downward, extending their channels into the branches of the root. Having attained their growth, they transform to pupæ in an enlarged cavity made for the purpose at the end of the burrow, during the latter part of September and through October. With the first frosts nearly all have changed to the imago or perfect stage, although it is stated that delayed specimens were to be found, passing their period of hibernation in both the larval and pupal forms.

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\* *Trans. Amer. Entomolog. Soc.*, vol. II, pp. 150-178. 1868-69.

The appearance of this insect, as larva, pupa and beetle, is shown in *b*, *c* and *d*, in enlarged views, from drawings by Riley. The operations of the larva within the roots and stem are represented at *a*. The beetle, like many of our more destructive insects and most difficult to control, is quite small, measuring less than one-tenth of an inch in length (.08 inch). It is elongate-ovate in form, of a reddish-brown color; head nearly concealed; thorax pubescent, large and almost as broad as long; wing-covers striated, and closely punctured in the interstices. The larva is described as of the normal form and character of the Scolytidæ, of a dingy-white color, with a honey-yellow head and brown mouth-parts.



Mr. W. W. Stacey, of Seneca county, from whom I have before quoted, expresses the alarm which the appearance, in such force, of this insect is exciting in his portion of the State. He writes: "In addition to the clover-fly, which cuts off an important source of income to our farmers from clover seed, appears another insect which attacks the clover plant itself, developing into a grub or insect which eats into the heart of the root, thus killing the plant. Our farmers justly regard this as the greatest evil that has yet befallen them, for clover is the sheet anchor of our husbandry, and any thing that tends to destroy its cultivation strikes a blow at the best system of rotation which we have yet found, and destroys the cheapest and best fertilizer known for our clay loams."

#### THE WHEAT-STEM MAGGOT — *Meromyza Americana* Fitch.

Some stalks of spring wheat, from a field in Scipioville, Cayuga county, N. Y., were submitted to my examination, about the 1st of August, which were seriously affected by some insect depredator, thought by the sender to be the "southern joint-worm."

An examination of the specimens sent revealed the ravages of a quite formidable depredator on the wheat, broadly distributed throughout the country, although thus far it has attracted very little attention. It does not appear to be known to our agriculturists, and has only, we believe, engaged the study of two of our entomological authors.

The heads were entirely destitute of kernels. Within some of the husks, the remains of the blossoms were discoverable, showing that their development had been arrested before the formation of the grain. Upon removing the investing sheath, the stem was found

to be discolored and shrunken, and quite dry for three or four inches above the joint; and near the joint it was so eaten and shriveled as to be utterly useless for the purpose of conveying the sap. Immediately above the joint, and surrounded by the remains of the stem, larvæ were discovered, a single one in each stem, of a watery-green color, elongate, quite tapering toward the terminal end, and sub-cylindrical at the other, and of a length of about one-fourth of an inch. In some of the stems, larvæ had assumed the pupal stage, not very unlike the larvæ in general appearance, but showing the wing-cases, a more acute form at its head, and more rounded at its anal extremity. The pupæ were also imbedded within the remains of the stem, at about the distance of an inch from the joint.

While examining the stems the day following their reception by me, on August 5th, two of the mature flies were discovered quietly moving over my table. They had probably emerged en route, and had escaped unnoticed by me from the box in which the plants had been sent. Although Dr. Fitch mentions the occurrence of this fly in wheat fields during the latter part of June, it appears that the first week in August is within its period of apparition in the State of New York, and, as indicated by the larvæ still unchanged at this time, the flies will continue to emerge throughout the month of August, and perhaps into September.

The insect, in its perfect state, is a fly not unlike our common house-fly (*Musca domestica*) in general shape, but of a more slender form, smaller and more delicately colored, and more conspicuously marked. It belongs to the family of Oscinidæ, which embraces several genera, and quite a large number of American species, of which by far the larger proportion have been described by Dr. Loew. This species was first described by Dr. Fitch, in the year 1854, in his second report on the insects of New York (First and Second Report, p. 299, 1856), under the name of *Meromyza Americana*. The description given is as follows: "It is 0.17 inch in length to the tips of its abdomen, and 0.20 inch to the end of its wings. It is yellowish-white, with a black spot on the top of its head, which is continued backward to the pedicel of the neck. Thorax with three broad black stripes, approaching each other anteriorly, but not coming in contact, the middle stripe prolonged anteriorly to the middle of the neck, and posteriorly to the apex of the scutellum. Abdomen with three broad, blackish stripes, which are confluent posteriorly, and interrupted at each of the sutures. Tips of the feet and veins of the hyaline wings blackish. Eyes bright green. Antennæ dusky on their upper side."

No account of the habits or transformations of the insect is given by Dr. Fitch, as they were unknown to him, as the flies had merely been taken by him by sweeping with a net over growing wheat. Its transformations were first observed by Prof. Riley, and published by him in the *Rural New Yorker* for January 28, 1869. In his *First Report on the Insects of Missouri*, 1869, its transformations are also described, the larval depredations narrated, and the

larval, pupal and perfect stages figured (pp. 159, 160, pl. 2, fig. 28). Prof. Townend Glover, for many years, and until recently, the Entomologist of the Department of Agriculture at Washington, in his *Manuscript Notes from My Journal — Diptera*, mentions the species, and states: "The larva lives in the stem of wheat, and injures it by gnawing the stalk from within, and by devouring the substance immediately above the upper joint." (His figure 32, of plate ix, represents the insect, and not figure 33 as stated.) It does not appear from the above brief mention, that it had come under the personal notice of the writer. Baron Osten Sacken has recorded the species in the two editions of his *Catalogue of the Diptera of North America* (pp. 84, 207: 1858, 1878), as the only known member of the genus, placing it between the well-known genera *Oscinis* and *Chlorops*. The species is also noticed in Hind's *Insects and Diseases Injurious to the Wheat Crops* [of Canada], Toronto, 1857, (p. 104), but the description is evidently borrowed from Dr. Fitch, and there is no evidence of its having been identified among the Canadian insects. The literature of the species, so far as we can discover, is limited to the above.

Prof. Riley noticed its operations about the middle of June, 1867, in all the wheat fields examined by him between St. Louis and seventy miles westward, to Bluffton on the Missouri river. From one to four per cent of the heads of wheat in these fields had turned yellow and apparently prematurely ripened, and on close inspection, were found to be stunned and shorter than the rest, and with their kernels withered and shrunk. The last or ear-bearing joint could be easily drawn out of its sheath in a yellow and dried condition with its lower end irregularly gnawed. The larvæ causing the injury were discovered very near the joint (within one-fourth of an inch). Specimens of the infested stalks were collected, within which the pupal state was soon assumed, and perfect insects emerged during the first week in July after a pupation of from twelve to fourteen days.

From the above notice to the present, we have no positive information of its depredations, but there is every reason to believe that they have been meanwhile continued, while inexcusably attributed to other of the well-known wheat insects, as the joint-worm, Hessian fly and the wheat-midge, by those who should have made themselves acquainted with the very different modes of operation from which their injuries result. It is somewhat singular that investigations were not continued upon an insect of so great economic importance and that there has not yet been given to us its complete history, commencing with the deposition of the egg.

The occurrence of this insect, in Medina county, Ohio, is, in all probability, indicated by an inquiry made by a correspondent of the *Country Gentleman* (issue of July 27, 1876), from Hinckley, O., for information of the insect which is injuring his spring wheat — a small white worm above the joint nearest the head, causing the head to die before it fills.

In Europe, several of the species of *Oscinis* and *Chlorops*, which

are closely allied to the *Meromyza*, are known to be injurious to wheat, rye and barley, and one of them, the *Oscinis vastator* Curtis, is reported as having the same habit with our *M. Americana*, the larva living near the base of the stem and eating out the plume of wheat, barley, etc., "thus destroying the future ear." *Oscinis frit* Linn., occupies the husks of the barley, injuring the crop in Sweden annually, as calculated by Linnæus a century ago, to the amount of half a million of dollars. *Oscinis granarius* Curtis, lives in the stems of wheat, but its excessive ravages are restrained by numerous *Pteromalus* parasites. *Oscinis pumilionis* occurs "in the lower part of stems of wheat, rye and barley, causing the plants to become stunted in growth." Other allied species (*O. tenuis* Meig., and others) are said to cause a swelling in the stems of wheat and barley, known, in England, as the *gout*.

The great need of the study of our injurious insects is shown in our almost entire ignorance of the habits and transformations of the destructive flies which comprise the family of Oscinidæ. Prof. Glover, in his report for the year 1872 (page 134), writes: "It is singular that we hear no particular or decided complaints from our own farmers of any insects in the stalks of wheat, excepting the well-known joint-worm, which is a hymenopterous insect, and has four wings instead of two. We have several species of Chlorops in this country, the flies of which are extremely abundant among the plants in grain fields, and no doubt, do attack our grain in the same manner as the European species, but as yet they have not done sufficient damage to attract the attention of the agriculturist."

Dr. Fitch, in his notice of the wheat and barley flies of the genera Chlorops and Oscinis and others (*First and Second Reports*, pp. 297, 298, 300), records and comments upon their abundance: "I have the present season discovered these small flies in abundance, in every wheat field in my neighborhood. On sweeping with a net anywhere among growing wheat, a multitude of them will be gathered. They are of several different kinds. \* \* \* \* \* One of these species [*Sapromyza* (*Chlorops*) *vulgaris*] was so abundant the latter part of June, that at almost every step in any of our wheat fields a dozen or more of them could be seen. \* \* \* \* \*

\* \* I doubt not it is from the number of these and other insect predators which abound upon our wheat, that we are no longer able to produce such crops of this grain as were uniformly harvested formerly, when our lands were newly cleared. How is it possible for wheat to grow with any thriftiness when it is incessantly assailed by such hosts of these enemies, bleeding it at every pore."

Of the above flies, Dr. Fitch names and describes *Siphonella obesa*, *Chlorops vulgaris*, *C. antennalis*, *Oscinis tibialis*, *O. coenodix*, *O. crassifemoris*, *Hylemyia deceptiva*, *Hylemyia similis* and *Agromyza tritici* (loc. cit., pp. 299-303) — all found upon wheat in wheat fields, except the latter, which was reared from larvæ crawling in immense numbers from unthreshed wheat in a barn. Of the

other eight species, nothing has been published of their depredations, habits or transformations, but we shall probably not err in accepting them as serious pests which are annually levying no inconsiderable tax upon our wheat crops.

Now that the *Meromyza Americana* has been discovered in a formidable attack upon the wheat crop in our State, and the method of its injury disclosed, we shall doubtless soon have occasion to make frequent reference to it. For the convenience of ready reference, a common name is desirable, which may easily be recalled by those not versed in entomological science; and as the larva is among the largest of the wheat-infesting Oscinidæ, it may with propriety be called the *wheat-stem maggot*.\* The distinctive name may not be agreeable to ears polite, yet it will have the merit of defining the order of insects to which it pertains, and names in popular use should at least convey no erroneous teaching. The joint-worm, the currant-worm, the meal-worm, etc., all belong to a different class of the animal kingdom from the worms; the grain-weevil is not a weevil, the latter being a beetle and the former a fly; and the carpet-bug is a beetle, and not a member of the order of bugs (Hemiptera). The name of maggot indicates the larval state of a fly, and should be allowed no farther latitude; a grub is understood to be the larva of a beetle, and a caterpillar, the larva of a butterfly or moth.

In the event of an increase of the wheat-stem maggot to a serious extent, we regret to have to state, that in all probability, very little can be done to control its ravages, and our main dependence will have to be on parasitic aid. Measures which can advantageously be employed in controlling other of our wheat pests, as turning over the soil or burning the stubble, would be of no avail with this insect. Its pupation and transformation to the perfect insect takes place, as previously related, *within the plant*, and it emerges before the grain is harvested. In some of the countries of Europe, where the ravages of the Oscinidæ are excessive, whenever they become extremely abundant, relief is found in a resort to the culture of other crops for a few years.

#### THE CORN CURCULIO — *Sphenophorus zeæ* Walsh.

During the latter part of June a number of snout-beetles, or weevils, belonging to the Curculionidæ were sent to me from Bordentown, New Jersey, with the statement that they were proving a serious annoyance to corn-fields in that vicinity. Their operations were secretly conducted, below the surface of the ground. Upon removing some of the earth from around the young shoots which were wilting and dying, from three to five of the beetles would be found as the cause of the destruction, clinging to the shoots which they had punctured with their beaks, and from which they were extracting the juices. They were proving a greater evil than the

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\* An allied European species, *Chlorops puomiltonis*, is known as the wheat-stem fly.

common cut-worms, as they continued their ravages later, even until after the middle of June.

The beetles, upon examination, were found to be the species described by Mr. Walsh, in the *Practical Entomologist*, in 1867, as *Sphenophorus zea*, from examples which he had received from Tioga county, N. Y., where, it was stated, they had pierced with their slender snouts or beaks, numerous small holes in the young stalks of corn near the ground. The sap which exuded from these punctures attracted numbers of ants to feed upon it, and they were, at first, believed to be the authors of the injuries, but later, the beetles were discovered in making the punctures. In the same year, reports were received that several fields of corn near the Susquehanna river had been nearly ruined by the same insect.

Prof. Riley, in his *Third Report on the Insects of Missouri*, 1871, p. 59, states that in 1868 he had received numerous specimens of the beetle from Geneva, Ontario county, N. Y., and also that he had found it in great numbers on the lake-beach at Chicago. He believes it to breed in moist and decaying wood, as it and other species of the genus have been found under such conditions, and in decayed logs floating in swamps.

Examples identical with those received from New Jersey are in the collection of the New York State Agricultural Society, placed therein and labeled by Dr. Fitch, probably about fifteen years ago, as *Sphenophorus venata* — the hunter weevil. No reference to the species, however, is to be found in his reports, and it is probably an erroneous identification with the *S. venatus* of Say, which Dr. Horn, as I am informed by Dr. Le Conte, regards as a synonym of *S. placidus*, together with *S. rectus* and *S. immunis* — all of Say. Mr. Walsh entertained some doubt of specific difference between the form named by him as *S. zea* and the *S. truncatus* of Say, but Dr. Horn, who has given critical study to this genus, believes it to be a distinct species.

Mr. Glover, in his *Report of the Entomologist*, contained in the *Report of the Commissioner of Agriculture for the year 1870*, makes mention (on p. 68) of a black curculio with curiously sculptured thorax, *Sphenophorus cariosus* Oliv., which had been received from New Jersey, where it was said to be destructive to young corn in the field by piercing the stems, *in which the larva lived and fed*. The accuracy of the statement relating to the larva may be questioned. Mr. Glover also states that another *Sphenophorus* had been sent several years previously from South Carolina, under the local name of *bill-bug*, which had been very destructive to growing maize in the low lands of the Pedee, where the plants attacked turned yellow, and many died.

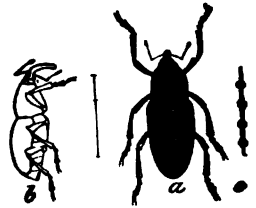
Dr. Packard also notices this insect, in Hayden's *Ninth Annual Report of the U. S. Geol. Geograph. Surv. Terr.* for 1875, quoting from Mr. Walsh and other writers.

The species of this genus are quite numerous, forty-one North American species being recorded in the Crotch Check List.



Although the *S. zœv* is not generally known as an injurious one, and may not occur in any great abundance over a wide extent of territory, yet, as it has an extensive distribution throughout the United States, extending from the Atlantic to the Mississippi, it is not improbable that it may be the unsuspected cause of much of the injury to young corn which is charged to cut-worms and other pests. When, therefore, the young shoots are seen to be injured from some not apparent cause, search should be made for the beetle beneath the ground, where, if present, it will probably be found, near to, or with its beak inserted in the plant.

The accompanying figures of the insect, together with the following description (mainly from Walsh), will enable the beetle to be recognized: length of body, about three-tenths of an inch; snout, one-tenth, quite curved, of the thickness of a stout horse-hair; color black, or brownish black; head finely punctured toward the base, with a large, dilated puncture between the eyes above; before the middle of the subtriangular thorax is a smooth diamond-shaped spot; on each side of this, another smooth spot of irregular shape; the other portions of the thorax are covered with large punctures; body sub-oval (as at *a*, and if side view at *b*); wing-cases with rows of larger punctures, placed wide apart on the grooves (represented in enlargement at *c*); a small, elongate-oval smooth spot on the shoulder, and another near the tip of the wing-case; beneath, polished, and with punctures as large as those of the thorax.



#### THE STALK-BORER — *Gortyna nitela* Guen.

An insect which has rarely, if ever, been known to exist in such numbers as to commit serious depredations, and which, by its comparative rarity and the nature of its food-plants, has never been classed by entomologists among the injurious insects, may, from an inexplicable combination of circumstances and conditions, suddenly appear in so great number as to enlist general attention to its extensive ravages. No better illustration of this fact can be given than that afforded by recent demonstrations of the Orthopterous insect, *Diapheromera femorata* (Say), — popularly known, from its long and attenuated body and limbs, as the walking-stick, skeleton-bug, spectre-insect, etc. This species, which had long been regarded as harmless and comparatively rare, has within a few years past increased to such an amazing extent in certain localities in Vermont, New York, New Jersey and elsewhere, as completely to devour the foliage of various kinds of trees over broad districts of woodland. In Yates county, New York, on the farm of Mr. G. C. Snow, their destructiveness, during the past six years, has been most remarkable, having entirely defoliated over twenty-five acres of hickory, oak,

etc., and caused the death of a large number of trees. In their travels to obtain food, they covered the fences and the ground, and their closely packed bodies were a hindrance to their progress. For an extended and interesting account of their extraordinary multiplication at this locality, the last report of Prof. Riley, contained in the *Annual Report of the Commissioner of Agriculture* for 1878, may be consulted.

Reference to the above insect has been made, prefatory to a short notice of occasional injuries to important crops, by the Noctuid moth, *Gortyna nitela*, Guen, or the stalk-borer. This insect has not secured a prominent place in the list of insect pests, yet at intervals, in certain localities, complaints are made of serious depredations inflicted by it. More frequently it falls under our notice as a borer in the pith of plants cultivated in our gardens, as in the stems of asters, dahlias, lilies, spinach, etc.

In the early part of July of last year examples of the larvæ were sent to me for their name and best method of checking their injuries from a gentleman residing at Monsey, Rockland county, N. Y. They had appeared in strong force in a potato field, and their burrows within the stems had caused a large number of the stems to wilt, and to break at holes which had been eaten into them, for the entrance of the larvæ or for the expulsion of the excrementa. The larvæ were fed by me for some time in confinement. They ate very greedily of the food furnished them, and having consumed the pith of a stem, they would emerge, and quickly eat their way through a round hole into another stem. They displayed remarkable activity in their movements. I failed in my efforts to carry them to maturity, and through their subsequent transformations.

The habits of this insect, as a borer, in its larval state, in the interior of growing plants, were first brought to notice in the *Prairie Farmer*, of Feb. 23d, 1867.

While many of our insects are confined to a single food-plant, and by far the larger number have a very limited range, this insect feeds on a large number of plants, differing greatly in character. In a notice of it by Miss Emma A. Smith, contained in the *Seventh Report on the Insects of Illinois*, for the year 1877, the following list of plants, the stems of which it bores, is given: Tomato, potato, spinach, wheat, corn, dahlias, asters, lilies, spirea, salvia, milk weed, castor bean, rhubarb, *Chenopodium* sp. ?, peach-twigs, currant-twigs, cockle-bur (*Xanthium strumarium*), rag-weed (*Ambrosia artemisiifolia*), and a variety of hearts-ease (*Polygonum*). It also eats the fruit of the tomato, and strawberries, and bores into the cob of ears of corn, as well as the stalk.

Among the records of its more serious injuries, are the following: In 1868, a potato-field at Lacon, Ill., was observed to have about every tenth stem occupied by this borer (*American Entomologist*, vol. i, p. 22).

In 1869, at Fox Creek, Mo., it was discovered boring into and

ruining great numbers of peach "buds" and shoots (*Amer. Entomologist*, vol. i, p. 206).

In 1869, it was reported from Farmington, Conn., as doing great damage to corn in that vicinity (*Amer. Entomologist*, vol. i, p. 252).

In 1871, at Blooming-grove, Wis., it occurred within the straw of nearly all the wheat-fields in the neighborhood. A piece of two acres of early wheat, near Madison, was entirely ruined by it (*Second Rep. Ins. Illinois*, p. 141).

In 1877, at Elmira, Ill., fifteen acres of corn were destroyed by its depredations. At Waterman, Ill., serious injury was done to many fields of corn. At Athens, Ill., it thinned the corn on new lands and foul fields to a considerable extent, proving to be quite destructive (*Seventh Rep. Ins. Ill.*, pp. 113, 221). In connection with the above notices of the depredations of this insect in Illinois, it is an interesting fact that the types of the American species of this genus described by Guenée—five in number—were specimens which had been collected in that State.

The moth belongs to the *Noctuidæ*—a large class of moths which fly after dark. It is quite plain in appearance, and would not arrest attention when met with, which is but seldom. It measures about one inch and a half in expanse. Its wings are of a wood-brown color, sprinkled with yellowish dots. The only conspicuous ornamentation is a yellowish-white line at



the outer third of the front wings, bent at nearly a right angle near the front margin; between this line and the outer border the wing is paler. It is represented above in figure 1.

The caterpillar, shown in fig. 2, measures over an inch long when fully grown. It is purplish-brown above, with three white lines on the back, of which the central one is continuous, and the other two interrupted from the fourth to the seventh segments inclusive. The first two segments have a white stripe on their sides, and above the third and fourth fleshy legs (prolegs) there is another white stripe. The head, and a corneous plate on the top of the first and last segments, are shining yellow, bordered on the sides with black. In its walking, which is quite rapid, the caterpillar arches its back somewhat like the Geometridæ (measuring worms), as it does not use its first pair of prolegs.

In the *Harris Entomological Correspondence*, p. 315, a detailed description of this caterpillar is given. It is described, under date of July 8th, 1848, as a caterpillar on potato stalks—not referred to any species, as it was unknown to the writer; but it evidently pertains to this insect. The addition of pig-weed is here made to its list of food-plants.

The history of the species, as far as known, is this: The egg has

not been observed. It is doubtless deposited by the moth during the early part of June, in our latitude, on the stem of the food-plant, near the ground. As soon as it hatches, the larva eats into the stem, to its pith or heart, and burrows in an upward direction. The hole through which it entered and the lower portion of its burrow is enlarged from time to time, with the growth of the larva, to admit of the rejection of its excrements. If the stem should not afford it a sufficient amount of food for the completion of its growth, it eats a hole outwardly for its escape, or escapes through the original opening, and passes to another stem into which it burrows. It attains its growth about the middle of August, when it changes to a pupa, either within its burrow, if affording it suitable conditions, or by deserting it and entering the ground to a slight depth. The pupation is a short one, and the perfect insect makes its appearance during the latter part of August or in September. My earliest date of the collection of the species is September 5th. It is believed to survive the winter in the winged state, and to reappear in the spring to deposit its eggs on the young plants.

This species seems to be a rare one in the vicinity of Albany. Among the scores of thousands of the Noctuids, which during the last few years have been collected by the Albany entomologists, by the *sugaring* method (attracting the moths to a bait spread upon trees), I have no knowledge of the occurrence of a single example of the species.

When this insect occurs in the potato, its presence can be readily detected by the withered stems before they have become broken down. By placing the point of a penknife in the opening and slitting the burrow upward, the caterpillar may be found and killed. If the field be large and too badly infested to permit the employment of this method, then if the vines can be collected and burned before the month of September, all the larvæ, or the pupæ which may be undergoing their change within the stems, will be destroyed. As early potatoes are more liable to be infested by this borer than the later ones, the burning method may be easily resorted to.

Another allied species is recognized in our Lists — the *Gortyna nebris* of Guenée, differing mainly in the presence of white reniform, orbicular and claviform spots on the front wings, and in slightly longer and more ascending palpi. Prof. Riley has reared *G. nebris* from the horse-weed, *Ambrosia trifida* L., and expresses a confidence that the two species (?) intergrade, and are simply varieties of one species. I have no knowledge of any description of the larva of *G. nebris*.

Twenty species of North American *Gortyna* are at present recorded. Of these, the larvæ of the greater number, from their concealed habits, are not known. The larval habits of the species are not uniform, for while those which Guenée includes in the genus *Hydræcia* are represented by him as "not living inclosed in stems and feeding on the pith, as those of *Gortyna*, but only concealed among the roots or the basal leaves of the plants" (of which are *nicti-*

*tans* Linn., *immanis* Guen., and *stramentosa* Guen.), others in addition to *G. nitela*, are known to be stalk-borers, as *G. rutila* Guen., in the columbine, *G. cataphracta* Grote, in thistle stems, and *G. flavago* W. V. of Europe, in thistle-stems and burdock. It is not a little remarkable, that of the old Linnæan species, *G. nictitans*, so very common both in Europe and the United States, the larva has not, so far as we have any record, been identified in this country. Our ignorance of the larva of the common *G. sera* Gr.-Rob., is scarcely less remarkable.

THE APPLE-TREE CASE-BEARER — *Coleophora malivorella* Riley.

An insect, quite injurious to apple trees, and previously unknown, has during the last year been brought into notice through its description and account of its ravages by Prof. Riley, in the *Report of the Entomologist* before referred to. I have no knowledge of its appearance in the State of New York, but its occurrence in large numbers in a bordering county — Erie county, Penn. — will undoubtedly soon bring it within the notice of the fruit growers of Western New York.

The new depredator is the larva of a small moth belonging to the family of Tineidæ.

The caterpillar, shown at *b* in the accompanying figure, is about one-sixth of an inch in length, of a yellowish color, with a large black head, its legs yellow and tipped with black, and its last two segments covered with brown granulations and bearing some long hairs.

The moth represented at *d* is about one-half inch in expanse, its pointed and long-fringed wings are mouse-colored, with some white scales near the base. The tip of the abdomen and the legs are white. The pupal form is seen at *c*. At *a* are shown the peculiar pistol-shaped cases, composed of silk, bits of leaves and excremental matter, which the caterpillar constructs for its protection, and which it carries about with it during its period of activity, serving also for its winter retreat and for its pupation.

The history of the insect, as given us in the Report above cited, is as follows: The parent moths appear abroad during the latter part of July, and deposit their eggs on the under side of the apple leaves. The larvæ hatch in September, and commence to feed upon



the under surface or the leaves. They are of the kind known as case-bearers, as they construct for their protection and occupation cases composed of silk, bits of leaves, and their excrements, which they carry about with them, thrusting out their anterior segments for the purpose of feeding. The cases have a peculiar curve at their posterior end, like the handle of a pistol. At the advent of winter they retreat within their cases, which they attach to the twig, and the less than half-grown caterpillar passes the winter in this condition. At this stage, the cases measure about one-tenth of an inch in length, and are more curved at their end than the mature form. From their small size and a color almost the same as that of the bark to which they are attached, they are not readily noticed.

In early spring the larvæ awake from their winter sleep, and transport themselves to the swelling buds, upon which they commence to feed. The leaves, as they develop, are attacked in turn, and where the insect abounds, they are rapidly devoured. The younger trees show branches which have been entirely defoliated, while others have been left leafless from the destruction of the buds. The young fruit is also eaten into, until barely a shell of it is left.

About the middle of June, the larvæ attain their growth, when they cease feeding, and fasten their cases to the twigs, and, within them, transform to the pupal state. Their pupation lasts for about three weeks, when the perfect insects emerge, and deposit their eggs upon the leaves, as before stated.

The operations of this insect pest were first noticed in 1877, in the orchard of Mr. William Fairweather, of the Densmore Apple Farm, at McLane, Erie county, Penn. In that year he reports that of the 8,000 trees in his orchard, there was scarcely one which was not more or less affected. On some of the smaller trees, the leaves were completely skeletonized. The following year, the ravages were still more destructive, and large numbers of trees were rendered nearly leafless. In a communication just received from Mr. Fairweather, he informs me that the destruction last year (1879) was less than in the two preceding years; but from the number of cases now to be found upon his trees he fears that their number, this year, will be sufficient to eat up every young leaf as it appears.

A parasite to this insect has been discovered in a small Chalcid fly, which seems to be rapidly increasing in numbers, and gives promise of being very efficient in destroying this new pest.

#### NOTICE OF DR. ASA FITCH.

It seems eminently fitting that in connection with the preceding notes upon the economic relations of some of our insects, reference should be made to one who labored long and successfully in the department of Economic Entomology — whose contributions therein gave him an exalted name among entomologists — and to whose enthusiastic, long continued and valuable labors that branch of natural science is largely indebted for the honorable position it now holds in our country.

Dr. Asa Fitch died at his residence at Salem, Washington county, N. Y., on the 8th of April, 1879, at the age of 70 years. His entomological studies commenced about the year 1840, at which time he prescribed for himself such an admirable plan for the direction of his future labors in the field of Entomology, that we will be pardoned for quoting it at length. He wrote thus:

"I have undertaken a very great work, and have laid for myself a task both hard in the plan and difficult in the execution. To unite in one very limited body the most essential facts of the history of insects; to class them with precision and accuracy in a natural series; to delineate the chief traits in their physiognomy; to trace in a laconic and strict manner their distinctive characters, and follow a course which shall correspond with the progress of the science and the eminent men who have contributed to its advancement; to single out the useful and obnoxious species, those which from their manner of living excite our curiosity; to mark the thousand sources where the authors of the original knowledge may be consulted; to render to Entomology that amiable simplicity which she has had in the times of Linnaeus, of Geoffrey, and of the first productions of Fabricius, and yet present her as she is to-day, with all the richness which she has acquired from observation, but without surcharging her with it; to conform her, in one word, to the model which I have under my eyes, the work of Cuvier — such is the end which I have taken upon myself to attain."

During the years 1845 to 1847, Dr. Fitch contributed a series of valuable papers on *Winter Insects of Eastern New York*, and others, to Emmons' *Quarterly Journal of Agriculture and Science*. In 1850, he prepared a descriptive catalogue of the United States insects of the suborder of Homoptera, which was published the following year in the *Fourth Annual Report on the N. Y. State Cabinet of Natural History*. These now scarcely accessible papers richly merit republication.

In the year 1854, his connection with this Society was commenced, in his selection by the Executive Committee of the Society to examine and report upon the Noxious, Beneficial, and other Insects of the State of New York, under an appropriation by the Legislature for that purpose. His first Report was presented under date of March 14, 1855. Under the continuation of the annual appropriations for the purpose, subsequent Reports were annually presented, with the exception of three intervals of a year each — to the number of fourteen — the last one published in the Transactions of the Society for the year 1870. In 1872, by an act of the Legislature, the office of State Entomologist was abolished — the impaired health of Dr. Fitch not permitting him longer to discharge the duties of the position.

The series of the Fitch Reports is regarded by Entomologists, and others who are prepared to appreciate their merit, as very valuable contributions to science. They are characterized by an untiring zeal, minuteness of observation, fulness of detail, faithfulness of

delineation and dignity of expression. They consist largely of the results of original research; and so highly were these researches estimated abroad, that he was elected to membership in the Entomological Societies of France and of Russia, and a gold medal was bestowed upon him by the Central Agricultural Society of France, in appreciation of his services to science. Among his foreign correspondents, he numbered Westwood and Curtis of London, Andrew Murray of Edinburgh, Dr. Gerstäcker of Berlin, Dr. Signoret and M. Selys de Longchamps of Paris, and many others of the most eminent entomologists of Europe.

It may properly be claimed that the New York Reports led the way for similar investigations in other States of the Union, and to the interest which they aroused, we are indebted for the valuable series of Riley's Reports on the Insects of Missouri — nine in number, and comprising over 1,800 pages and numerous illustrations of a high order, — the Reports of the State Entomologists of Illinois, and others.

The labors of Dr. Fitch will long be held in grateful remembrance, and the New York State Agricultural Society may justly lay claim to having, by its action in connection therewith, done very much toward the promotion of Entomological research, not only within the immediate sphere of its labors, but throughout the Union, and to science at large, coextensive with the civilized world.

NEW YORK STATE MUSEUM OF NATURAL HISTORY,

*January 20, 1880.*

## POULTRY BREEDING, BY NATURAL AND ARTIFICIAL MEANS.

[Paper read at the Society's Meeting at Utica, September 10, 1879.]

By A. M. HALSTED, Rye, N. Y.

The science of poultry breeding — for it is a science, and one which has taken fully as much study and patience as in larger stock — is one that is receiving the attention of people throughout the United States as well as in Europe.

The extent and importance to which the interest has grown is almost incredible; especially so to those of us who remember how, in our boyhood days, the chickens were looked upon as a necessary nuisance, to be tolerated because the female portion of the household looked to them for a supply of pin-money. In those days — and those, to us, bygone days, are still things of the present, in many sections of the country — the fowls were regarded as a species of freebooters. They roamed when and where they pleased. If perchance, they were too free in the garden, the house dog was set upon them to drive them out, or they were pelted with stones,



sticks or whatever was most handy. They roosted in summer in the trees around the door yard; in winter under the hovels and sheds, or the carts, wagons, ladders or wherever they could find a place.

For nests they had nearly all creation: the manger in the stable, the hay-mow in the barn, the old sleigh under the cow shed, the blackberry patch in the corner of the hog yard, the brush heap in the wood yard, or the high grass and weeds in the neighboring meadow. Semi-periodical egg hunts were made, and the eggs obtained sent to the country store and traded off for needles, thread and other etceteras; many of the eggs proving to the final possessor to be rather too old for omelet and too young for broilers.

With the young chickens the chances were the same. If a hen succeeded in hiding her nest so neither human nor animal foe discovered it, she usually brought out a brood of chicks nearly as wild as young partridges. Later in the season, as eggs became more plenty at the stores, some hens were set, and as fast as the chicks got old enough they were killed and sold as broilers; those which were too wild to catch, and too late-hatched to bring good prices, being left for stock the next season. This was the only "survival of the fittest" known to the poultry keepers of those days. As to feed, the wood pile, barn yard, hog pen and kitchen door steps were the "restaurants" of the summer, and in winter a few handfuls of corn in the morning were thought to be all that was necessary.

The weight of the fowls of those days was from three to three and a half pounds. Occasionally a "bouncer" of five pounds caused the neighbors to inquire into the why and wherefore of its superior size.

The eggs averaged twelve to the pound, and were not over plenty at that.

Ducks, geese and turkeys were rather better cared for; but even they received only enough attention to preserve their lives, which would certainly be lost were they given no more care than the chickens.

Compared with the poultry keeping and breeding of the present day, one can quickly realize the great improvement that has been made.

Eggs average eight and nine to the pound, and frequently, by care and selection of stock, even an average of seven has been produced by some careful breeder. Broilers are made to weigh one and a half to two pounds at six weeks old, and adult fowls frequently dress eight and nine pounds, and I have known instances of twelve pounds and over.

The same ratio of increase is noticeable in turkeys, ducks and geese. Since the poultry interest has assumed such importance, we often find turkeys in our markets weighing twenty to twenty-five pounds. Fifteen to eighteen pounds was formerly considered extraordinary weight; and if a pair of ducks reached eight pounds, the producer was well satisfied he had something above the average.

Now ten pounds is not unusual. Last fall I killed both Rouen and Aylesburys, which, at four to five months old, dressed ten pounds to the pair. Twelve, and even fourteen, pounds have been recorded as the weight of full-grown specimens.

The same in geese — the improved breeds, Bremen or Embden, and Toulouse. Twenty pounds *now* is not at all unusual in our Christmas markets. Pairs of the latter have been exhibited in England which weighed, *alive*, fifty-six pounds — nearly or quite double the weights of good specimens twenty-five years ago.

Nor is the improvement confined to size and weight. Quality, as well, has been looked for. Plump-bodied, full-breasted, yellow-fleshed, and juicy, tender-meated chickens now take the place of the lean and tough broiler of bygone days.

In eggs, the improvement in quality is equally noticeable. The idea that *an egg is an egg*, no matter whether fresh or stale, whether stringy and tasteless or meaty and rich, has been exploded. We find that there is as much difference in the quality of eggs as with any other article of food; the quality being practically under control of the breeder. If the fowls have to shift for themselves, getting a precarious living in the barn yard, stable and door yard, the eggs cannot have the rich, melting quality which results from a good, generous diet of grain and prepared food. We might as well expect the same quality of meat in the half-wild Texan steer as we get in the thoroughbred shorthorn. The breed or variety has much to do with the quality. A *thoroughbred*, whether in cattle, sheep, swine or poultry, may be relied upon to make a better quality of food than a so-called "*native*" or mongrel. In egg production, as in butter, the thoroughbred produces the choicest quality.

Premising this much brings me to the consideration of the means of attaining the desired quality, which is by breeding and careful selection. My object in referring to, and perhaps comparing, natural and artificial methods, is not to institute a critical comparison between the two, but rather with a view to meet the wants and tastes of the advocates of both systems. And yet they can hardly be called separate *methods* or systems, for "*artificial breeding*" is not an entirely distinct mode of raising poultry, but simply an addition or improvement to the usual method, designed to increase the business, with a lessened expense and greater profits.

I am aware that there are numbers of people who ridicule the idea of raising poultry by artificial means. There is a class of self-complacent individuals who ridicule any thing new as preposterous; because their forefathers got along without it, it is not needed now, and, not being needed, it therefore *must* be a failure. Content to plod through their lives in the same old ruts, they receive alike every thing *new*. To them the world owes nothing. Steam, electricity, with their results — railways, steamships, telegraphs, etc. — would still be among the unknown, had the world waited for their investigations or indorsement. To this class of people we have nothing to say. Plunged in the darkness of their overweening self-

esteem, all attempts to enlighten them prove fruitless. They will not believe the evidence of their own senses, much less the testimony of others who have tested the matter with *satisfactory* results.

I shall consider this subject of poultry breeding from a commercial point of view; that is, rearing them for market—the same treatment, modified, being adapted to the needs of the breeder who raises only enough for his own table.

First, then, the location. My selection would be a dry situation, with a southern or south-eastern slope. If on the bank of a lake or pond, well; but I should prefer a small stream. A rough piece of land, with some underbrush and rocks, is not objectionable, unless the rocks are broken and piled up, so as to make a harbor for rats or weasels. Some underbrush is desirable for shade, and, if there was none on the place selected, I should plant low-growing evergreens and currant-bushes; the latter are beneficial for their fruit—the fowls being very fond of it—as well as for shelter from the heat of the sun.

In the buildings to shelter the fowls I would advise a number of small houses, rather than one of large size, for the breeding stock. A convenient as well as economical way would be to build each house *double*; that is, to shelter two yards or flocks of fowls, letting the dividing fence join the house in the center. Houses twelve feet long by eight feet wide, six feet high on the back and eight feet in front, will make two apartments, each large enough to accommodate fifty hens and four cocks, which are as many as had best be kept together. Provision must be made for ventilation, which in hot weather must be ample. The yard for this number should be not less than one-quarter acre, two-thirds of which should be in grass; the remainder, in bare earth, should be turned in alternate portions, either by plow or spade, every week. A small shed, not necessarily over three or four feet high—a few boards held up by a light frame will answer—should be provided, under which fix a dusting place of fine sand, wood ashes and some tobacco dust. It is thus dry in all weather. In exposed situations, I would make this shed, for winter use, by raising the front three feet high, and letting the back down to and with the ground, having it open to the south. In another part of the yard place a trough or shallow box, in which keep a supply of fine gravel; unless the soil is gravelly, in which case it is not needed.

In fencing the yards, the height will have to be regulated by the breed of fowls kept. The Asiatics require only a fence of three feet to keep them in bounds, while the Leghorns and other light-bodied kinds will readily go over a board or picket fence six or eight feet high. The past season I have put up some fencing of wire netting, five feet wide, with a board underneath, making the fence nearly six feet high, and I find my Leghorns are perfectly controlled by it—better, in fact, than by a picket fence two feet higher, which I had been using. In putting up wire fencing, never

use a top rail; it gives the fowls a foot-hold to light upon, and they are certain to fly over.

In addition to the buildings for the breeding stock, there will be required a sitting or hatching room; a nursery for the young chicks, which should be partly covered with glass; and a second building, into which they must be placed when four to five weeks old. The size of these buildings is to be governed by the extent of the business. Besides these, there might be profitably used one or more sheds, peaked roof, open on all sides, with perches placed not less than four feet from the ground. After the middle of April, the chicks that are old enough should be made to roost in them.

In the selection of stock, the breeder must be governed by the character of the business he has in view. If the production of eggs be the chief object, then his choice would naturally be the Leghorns, Houdans, or a cross of these upon some other breed. If the raising of poultry for market, his choice would have a much wider range. On this point we could hardly find any two fanciers perfectly agree. One, with his Brahmas, is positive nothing can be better; another says his Cochins leave nothing to be desired; a third swears by his Games; and a fourth is confident the Houdans are the best in all creation; while still another, agreeing that all these may be good in their way, *knows* that his crosses combine more *good* qualities than it is possible to get into any one pure-bred variety. And each one is right in his opinion. The breed he has *suits* him, and he can make more out of it than he could from some other kinds, which, not being fancied, would receive less care and attention from him.

We see this question of "What breed shall I get?" illustrated over and over again in this way; and our advice to such inquiries is, try that which best suits your fancy. You will undoubtedly make that succeed. Of course, in such advice, it is understood that the selection will be made from some of those varieties which excel in the qualities desired.

In selecting the laying stock, it is best to have one-half pullets of the last season's hatch, and the remainder hens of one year old. Mate the first with adult cocks, the last with cockerels of the previous year. This gives stronger and more vigorous progeny. In the choice of cocks, select strong, vigorous birds, with a loud, long, full crow. Such a bird has abundance of lung power, and necessarily is in perfect health. Select your hens with a view to what you expect from them. By thus selecting the stock, we have no cessation of eggs. The pullets commence laying in the late fall or early winter, and by the time their first clutch is laid out, the hens are ready to take up their share of the work. This is usually in February; and by the middle of March they are through their first clutch, and, if not of the non-sitting breeds, ready to assume the duties of incubation.

Much of success depends on the *care of the eggs*. In cold weather, it is best to gather them twice a day, morning and night; and in

warm weather once a day, at night. If neglected, and a broody hen should remain on them over night, the chances are that they are spoiled. A very few hours of the proper heat develops the germ, and if a cessation of heat follows the life is killed.

Some few years since, a tabulated statement went the rounds of the press, showing that a hen could not possibly lay more than 600 eggs during the course of her natural life. This number was *parceled out* as follows:

During the first year after birth .....	15 to 20
second year .....	100 to 120
third year .....	120 to 135
fourth year .....	100 to 115
fifth year .....	60 to 80
sixth year .....	50 to 60
seventh year .....	35 to 40
eighth year .....	15 to 20

This was assumed from a microscopic investigation of the ovarium of a hen by some European savant.

For once, science is wrong. Within the past five years, a number of persons have kept careful count, and have found an egg production in some cases of nearly 1,000 during the eight or nine years of a hen's life. I, myself, have had a yield of over 350 eggs per hen in two years' time, from a flock of Creve Cœurs, and my Brown Leghorns yearly exceed that record.

The present season, since January 1st, from a flock of 61 hens at first, of which two died in February and March, and 34 were killed for the table prior to July, I have gathered, up to September 1st, 6,257 eggs. Taking 43 as the average number through the season, this gives an average per hen of 145 eggs for eight months. Of these 61 hens only 25 were Brown Leghorns, six were Light Brahmas, four Plymouth Rocks, and the rest crosses and mongrels. Had the flock been all Leghorns, I have no doubt but the average would have been fully 175 eggs per hen.

This production of eggs may be forced by suitable feeding; and in breeding for profit it should be done. Assuming the table given above as correct in the proportion of eggs laid at certain ages of the fowl, it follows that, to get the full value of the egg production, we must keep her until the fourth year. If, by proper feeding and attention, we can cause her to lay three-fourths or more of that possible number during the first two years, we can then fit her for market, and fill her place in the yard by younger fowls, to go through the same forcing process. It is folly to feed and keep a hen four years, when the bulk of profit may be obtained from her in half that time. I should therefore advise fitting her for market as soon as she has finished the best of her second season's laying, which is usually about June.

The cocks may be kept until three years old, if desired, but

usually two years will be found the most profitable age to market them.

The Asiatics, and also some other varieties, are sometimes troublesome in their disposition to sit. When they are so persistent in the matter, and it is desired to have them laying again, either of these two methods will be found efficacious: Put the hen in a box with a lath bottom, the laths not over an inch wide and two inches apart; the box raised a foot or more above the floor. Having no way of keeping her feet and breast warm, the feverish desire to sit is soon cooled off, and usually in three days she is ready to be turned again into the yard. Another remedy is to put the hen in a small pen, with no perches, and place with her a vigorous young cock, kept by himself for this purpose. Two or three days will usually effect the desired result. Where the hens are to do the hatching, they need to be moved to the sitting-room. This should be done at night. Have the nest ready, with a half-dozen nest eggs, and fitted with a cover. After dark, take the hen, in a basket, to the room, and gently place her on the nest, covering or shutting her in. Do not open the nest again until the next evening, when let her out and give her food and water; after fifteen or twenty minutes, if she does not go on herself, catch her and put her on again, shutting her in. This may need to be repeated three or four days; but usually, unless the hen is nervous and wild, she will take to her nest of her own accord after the second day. When she does, then give her her eggs.

The French use turkeys for hatching, and in some cases on quite a large scale. In some sections there are men who follow it as a business, hatching out chickens for the neighboring farmers at so much a piece, or buying the eggs and selling the chickens as soon as old enough. One person in the vicinity of Lyons has sixty turkeys sitting in the hatching season. It is not necessary that the turkeys should be broody. When wanted they are caught, given a small wineglassful of spirits, and placed on the nest with some dummy eggs under them. When they come out of their "drunk," they either imagine that they have legitimately begun their new business, or are so ashamed of their spree that, rather than show themselves to their mates, they remain in seclusion.

Another method, somewhat longer, is sometimes used. The turkeys are caught and placed upon nests, the same as described above for hens, and treated in the same manner, and in two or three days they become broody and are given good eggs. These turkeys are kept sitting two or three months at a time; as fast as the chicks hatch they are taken away, and a fresh nest of eggs given to her. An ordinary sized turkey will cover twenty eggs.

Artificial incubation and incubators have now been brought to such high perfection that it seems almost folly to cling to the old methods, except when it is impossible to avail oneself of the new.

The artificial method is far ahead of the natural, in that every fertile egg can be (and has been, again and again, the past season)

hatched. In it we have to allow nothing for breakage by hens, or loss by hens leaving their nest, or trampling the half-hatched chicks to death by young and nervous hens. The cost of incubation is less, and the "artificial hen" always broody when you want her so.

In both the natural and artificial methods it is necessary to full success that the eggs receive a daily airing. The hen must be taken off her nest, if she does not come off, of her own accord; and the eggs in the incubator must be taken out and aired for ten to twenty minutes. The *natural* treatment must be followed in both cases.

During dry seasons it is well to sprinkle the eggs twice or three times a week, while the hen is off the nest. In the Incubator they should be sprinkled daily. This keeps the shell and inner membrane soft, and the chick comes out quicker and stronger. As the chicks dry off take them from the nest and cover them with any warm substance until all are hatched; then if the hen is to mother them put her out with them.

Just here, the artificial mother or Brooder comes in as an aid to the natural system. As fast as the chicks dry, take them from the hen and put them in the brooder. This being kept warm by a small lamp keeps them warm and dry and gives them all the brooding they need — more than the hen, for the artificial mother is always ready to hover her chicks, which the hen is not.

The hen can then be given another nest of eggs, and in some cases even a third clutch may be had. When turkeys are used, four, five and even six hatches have been obtained in succession. This, however, necessitates a great deal of attention, for the turkeys will not leave their nests voluntarily, but must be taken off regularly and fed, and the nests cleaned. Frequently after the third sitting they refuse food, and then have to be fed by hand, or crammed.

The young chicks need no food until about 24 hours old; then give them the yolk of a hard boiled egg, crumbled or chopped fine. This may be their food for two or at most three days, after which mix coarse corn-meal and wheat bran, equal parts, and *scald* it with boiling water. When a week old, add once a day, a fourth part of ground scraps, or a little boiled meat or liver, chopped fine. Have a pan of fine gravel within their reach and also some lime rubbish, old mortar, or broken oyster or clam shells. If near the sea-shore get a few bushels of shells, throw them on a pile of brush and burn them; then break them up and put them in the yards for both old and young fowls. At two weeks old, begin feeding cracked corn, wheat, or buckwheat at night. Up to this time the chicks should be fed from five to seven times a day; every two or three hours; after three weeks old three times a day will be sufficient.

In addition to the *menu* given above, there may be added occasionally feeds of boiled rice, small potatoes boiled and mashed and mixed with a little corn or barley meal, bread crumbs and stale bread steeped in milk or water. In fact all the scraps from the table should be saved and given to them as soon as they are old enough. On the farm, where milk is abundant, scald the meal with the hot whey

of curded milk, mixing the curd in with it. Into this a little red pepper and powdered charcoal may occasionally be put. Vegetable food should always be given at least every other day; cabbage leaves chopped, a few carrots minced fine, onions also chopped may be mixed with the scalded food; until about a week before killing, when the latter should not be given; best of all is lettuce, this may be raised in shallow boxes (called flats by gardeners) which can be started in any sunny window, and if placed at night out of reach of frost, can be raised without any artificial heat. The value of table scraps as food for both old and young fowls is rarely fully estimated. If in the vicinity of a large hotel, the breeder would be well repaid even in buying the scraps and carting them home.

The success of Mr. Warren Leland in his poultry raising was largely due to this supply of food. At that time he was one of the proprietors of the Metropolitan Hotel in New York city, all the scraps from which, amounting to fifteen or twenty barrels weekly, were sent to his farm, and used for feeding the poultry and pigs.

To give delicacy of flesh to the chicks, make their principal food, for a week or ten days before killing, barley meal moistened with milk. Alternate with Indian meal scalded with either water or milk. During this process the chicks had best be kept confined in a darkened room. If the business is conducted on a scale sufficiently large to warrant the expense, I should advise the use of a fattening house, with apparatus for cramming. This process is better adapted to older stock—say six to eight months birds, but still may be used with profit on broilers from the sixth to the eighth week.

Bear in mind always, that the profit in chicks is made by getting them fit for market at the earliest possible age; and to do this they must be fed early, often, and no more than they will eat at a time. Give them fresh, clean water to drink; placing the drinking vessels where the sun will not reach them, and where the chicks will not scratch dirt into them. The average cost of hatching and raising a chicken (I speak now by artificial means) to eight weeks old is not over 15 cents. At this age it should weigh from one and a half to two pounds, if forced. The cost of the next two months will be full 15 cents more, while the weight will not gain over one pound. It follows, therefore, that the most of the profit comes from the first two months' care and feeding. Broilers at that age, in New York, Philadelphia or Boston, will sell during April, May and June at from 75 cents to \$1 per pair, and sometimes as high as \$1.50 per pair early in the spring.

At this rate there is a large profit on the early-hatched broods; and prices for good broilers (plump chickens under two pounds each) will usually hold up to 50 and 60 cents per pair until October.

During the late fall and winter months an Eastern breeder cannot hope to compete with the Western producers. Adult fowls can be raised there and marketed here (during cold weather) at much



less figures than we at the East can do it. It is only by improving the *quality* of the birds marketed, and getting them into market at an early age, that we can make a paying business of it.

To do this, the breeder must avail himself of artificial means. It is an absolute necessity to success that he employ incubators and brooders in connection with the natural methods.

I say, "in connection with," for I do not advise the use of artificial means to the entire exclusion of the natural. Taking, for instance, a business in which it is proposed to keep 500 hens: these, at an average of 150 eggs each, will give 75,000 eggs per year. Now, allow each hen to sit twice, 13 eggs being her nest; we have then used 13,000 eggs, and have 62,000, which we are obliged to dispose of otherwise.

With six incubators, of 200 eggs capacity each, we could use all of this surplus, and produce a total of 53,550 chickens. Allowing each hen to hatch 10 chicks per sitting — 20 chicks in all — we have 10,000 more, making 63,550. Now, the care of these six incubators need not take over three hours per day; while the proper care of the hens, the necessary watching to see that they do not get off their nests, feeding, watering, cleaning the apartment and nests, etc., would take fully as much time, and if only 100 hens were sitting at once, the time would extend through seven months, with a return of less than one-fifth that of the incubators.

In this we have given the hens credit for about 77 per cent, while the *average* hatch with hens, where large numbers are kept and set, is not over 60 per cent. Figuring at this latter percentage, we should get only 7,800 chickens against 31,237, which would be the equivalent for the incubators for the same length of time.

The incubators we have credited with a hatch of 87½ per cent, while 90 and 95 per cent are now common averages with the Centennial Incubator (one of which is now on exhibition on the Fair grounds).

Next we will consider the advantages of artificial rearing over the natural method. This, of course, involves an outlay for brooders, or their equivalent. Here let me say, in an extensive establishment of the kind we have under consideration, I should advise a building fitted with permanent brooding arrangements. Now, returning to our natural method, we have 500 hens, each of which is expected to hatch two broods of chickens, 100 of which are supposed to sit and hatch every three weeks. Allow each hen to have 20 chicks, and we have 50 coops to provide every three weeks. Each hen will run with her brood four weeks, and early in the spring the chicks must stay in the coop until six weeks old. For winter raising, which *must* be done, a house will have to be prepared and the hens and coops kept in it. This will necessitate the use of 150 coops, which, at \$2 each, will cost \$300. To this may also be added the cost of the house. If portable brooders were used, and the chicks taken from the hens as soon as hatched and put into them, it would require twenty-five (25) brooders which would cost

§375. These can be used in the open air and need no house, an open shed for the chicks to run and wallow under in stormy weather being all that is necessary. The *cost* would be about equal in both cases; while the labor in caring for them would be largely in favor of the brooders, in that with the coops there would be 100 to be fed and shut up every night, against 25 of the brooders. Then, again, with every coop and old hen there is as much dirt and filth to be cleaned out every few days as there will be in a brooder for a month, the hen fouling the coop more in one day than a brood of 50 chicks would in a week. In addition to this gain, is that of the use of the hen for five or six weeks, during which she may be made to produce 20 or 25 eggs.

But discarding the portable brooder, and using a house fixed as suggested above, the entire expense for the accommodation of the chicks hatched by that number of hens need not exceed \$500.

The saving in labor alone, over the hen and coop system, would pay a large interest on the investment. To go into it as extensively as the above mentioned estimate would necessitate, would preclude the use of hens and coops in rearing, and the artificial method would have to be adopted; and while the first expense would have to be comparatively large, it would require a very small annual outlay to keep every thing in working order. The saving of chicks from casualties, from neglect, by the hens pecking and trampling, has been found to more than repay the outlay, even in small poultry establishments. In large enterprises the percentage of loss is always more, and the saving would consequently be still greater.

#### DISCUSSION.

After the reading of the paper, the author was interrogated by the audience, and the following dialogue took place:

Q. Are chicks raised by the artificial mother as healthy and vigorous as those raised by the natural mother?

A. Yes, more so. With the natural mother, in a few days lice are found in the head of the chicks, which appear to be the foundation of the lice crop. With the artificial mother, this is avoided. She does not wander and cause her chicks to perish by exposure. They need to be kept warm, well fed and clean.

Q. Do artificially-hatched chicks suffer from gapes or chicken cholera?

A. No; they are free from lice; and I have found the first lice, under the microscope, are different from those illustrated by the authorities. I also have found there is some connection between them and the gapes. When kept free from these lice, gapes do not appear. Gapes are caused by little worms in the windpipe. How they come there, no one knows. Certainly, when kept free from these lice, the gapes do not trouble the chick. These first lice in the head of the chick appear like ticks, burying in the skin so that the chicks will peep when the tick is pulled out. I have never had

cholera among my chicks. The cleanliness that keeps off the lice may also keep off the insect that produces the gape worm.

Q. Is it necessary to exercise particular care in handling eggs to be set, in order to have them hatch?

A. They have to be handled like eggs; but I have never taken any special care in handling. They will stand much rougher usage than many suppose. I have transported eggs long distances, and had good luck in hatching them. Eggs sent to fairs have hatched well in the incubator. An egg will stand more neglect than is supposed. If we give it a violent jar, that breaks the thread-like connection of the egg with the ends of the shell, it will not hatch. So long as this connection remains intact, no harm is done.

Q. Have you suffered any loss of eggs from thunder?

A. I have had no loss from the effects of thunder. In one instance, some goose eggs were apparently retarded two weeks in their hatching, by thunder, the hen sitting on them six weeks instead of four. But only three goslings appeared.

Q. How many hens are necessary to work an incubator profitably?

A. It depends upon what we raise chicks for. The incubator will hatch 136 eggs: It will be best to begin with 25 or 30 hens. These will keep an incubator running. You may start the sitting under the hen and remove the eggs to the incubator when there is room. If 300 chicks a year are raised, there will be a saving of full 25 per cent. I would almost guarantee 100 chicks from every incubator full of eggs.

Q. Do you feed food raw or scalded?

A. I scald, and believe it pays to cook. There is a decided saving, and animals as chicks do better on cooked food. I feed differently to fat from what I do to make hens lay.

Q. Can the incubator be kept running by putting in eggs as fast as the chicks come out?

A. Yes. You can begin with six eggs, and add as fast as you get the eggs, so that chicks may come off every day and eggs be added.

Q. Will cistern water breed disease?

A. That depends upon how the cistern is kept. I can't see why clean rain-water should be worse for chickens than cattle. Foul water is bad, but pure water from any source is wholesome.

Q. Have you ever used stimulating food to make hens lay?

A. No. I give good wholesome food in generous quantity. It cannot be good to artificially stimulate. I once tried feeding during the night. This was for fattening, and at the suggestion of a friend, who in one instance made chickens six weeks old weigh 1½ lbs. by night feeding.

Q. Would you recommend night feeding?

A. Yes, if I were raising chickens for market. But, after six weeks, profit in feeding ends or greatly diminishes. After that, the chickens require double the amount of food to produce the same

growth. For fattening, the Brown Leghorn at six weeks is about as good as any. Have found a cross of Dorking cock on a Light Brahma hen profitable for market.

Prof. Law said he imagined he saw in the incubator an escape from chicken cholera and other diseases. Parasites in the intestines cause cholera. Keep hens clean, and give them clean food, and disease is escaped. Foul water, as the filthy pools in the barnyard, are likely to breed disease by introducing parasites or their eggs. The chicks picking the lice off each other's heads may become diseased, the larvæ being thus introduced. He followed with a few remarks on pleuro-pneumonia in cattle by request of the audience. The disease is misnamed, as it is not confined to the lungs, but develops wherever the infection is introduced. A brief history of the disease was given. The disease is spread by infection, through the air as well as through other channels. Disinfection is more important than stamping out. It is sometimes transmitted in the clothing of keepers, who pass from the diseased to the healthy animals. The disease is severer in hot than in cold climates, and in hot than in cold weather. If it reaches the plains of Texas, it will be a great calamity, as it will be beyond our power to disinfect or stamp it out. There is great danger of this catastrophe. If it gets West, it will return to the East with every car-load of cattle.

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## ABOUT POTATOES.

Paper read at the society's meeting at Utica, September 12, 1879, by ISAAC F. TILLINGHAST, Factoryville, Pa.

History informs us that potatoes were first found growing in the wilds of South America, early in the seventeenth century; but they were by no means found in the state of perfection of the beautiful mealy tubers that may be seen to-day upon our dinner-tables.

For nearly a century, so slow was their improvement that they were cultivated to but a very slight extent as an article of food. But how great a change has been wrought within the last half century? To-day, as a staple article of food, the potato stands next in importance to wheat in nearly all sections of the globe. It is one of the necessities of every-day life, esteemed alike by prince and peasant; therefore whatever can be done by our American farmers to improve it in quality, or prevent its deterioration, should by all means be taken advantage of.

That the natural tendency of the potato, when propagated from tubers in the usual manner, is to retrograde, is a point which I think is no longer questioned by any observing grower — the rapidity of the degeneration depending greatly upon the circumstances and conditions under which it is grown. The cause may be a continued planting for a series of years of the same seed-potatoes upon the

same soil, or in the same locality — unsuitable soil — injudicious use of fertilizers, or the lack of them — want of vigor, either constitutional or caused by unfavorable seasons, or imperfect cultivation and neglect. The remedy is not only to procure varieties recently produced from the seed ball, but to select such new ones that have the greatest amount of natural vigor. While it is imperative that we frequently procure a newly originated variety to produce the best results, it must be remembered that the simple fact of its being new is by no means a guarantee that it is valuable. Probably not more than one in five hundred of the chance seedlings produced from balls taken at random from a field will be of more value than its parent, while many of them will so closely resemble the parent that they are not readily distinguishable. In nearly every instance of new varieties which have possessed intrinsic merits enough to enable them to stand the trial and become general favorites in widely-spread localities, the originator selected them, by a careful comparison, from hundreds and in many instances from many thousands of seedlings. The chances of producing a new seedling more meritorious than those we already have are probably no greater in potatoes than in apples or other fruits. The Rhode Island Greening, Northern Spy, and Baldwin, and in fact all of the magnificent varieties of apples which are displayed upon the tables at the fair ground, of course originated from apple seeds. Yet how many natural fruit seedlings do you imagine you would have to produce in order to find one among them which would even equal those justly-celebrated varieties in combined valuable characteristics? If our best and most vigorous varieties are selected as parents and the blossoms fertilized with pollen from other vigorous varieties, which possess different but equally valuable characteristics, the results of combining the valuable traits in the character of each will no doubt be seen as surely in vegetable as in animal life. For these reasons our best new varieties are from hybridized seeds planted and cultivated in a manner calculated to inspire as great a degree of productiveness and vigor as possible. And yet we neither hope nor expect even these to retain their productiveness for many years. Even the best among them must give way as fast as they lose their vigor, and newer and more vigorous varieties make their appearance.

The vigor and productiveness of any variety of potatoes may be greatly prolonged by annually selecting for seed the largest and most matured tubers and being careful to keep the plot from which the next season's seed is to be selected in the highest possible state of cultivation.

By this I do not mean excessively manured — for that might tend to produce disease — but thoroughly tilled.

SMALL POTATOES are unfit for use for several reasons. A continual planting of them will soon reduce the vigor of any variety. They are more apt to be unripe and lacking in vitality. In using small potatoes for seed you will almost invariably get too

many eyes in each hill and the consequence will be so many sprouts will start from one point and so many new tubers will form that none of them can have a chance to develop fully, hence you reap what you sow — only small potatoes. Two or at most three good eyes in a hill is seed enough in any case and larger tubers will be formed by planting only one, hence cutting the tubers and dividing them before planting is advised. A small tuber contains about as many eyes as a large one. If deposited whole too many eyes are planted, if divided the pieces do not contain sufficient substance to properly nourish the young plant until it can get its sustenance from the soil. The very best results may be obtained by selecting the largest and handsomest specimens. Then cut out or remove all the eyes except one of two of the strongest and plant as much as possible of the potato and but one in a hill. In this way you will get a strong and vigorous growth from the start, and the more vigorous your vines the larger and better will be the product as a rule. Especially will this be desirable since the advent of that devouring enemy the Colorado beetle.

Of course such a process is altogether impracticable to perform on a large scale, as the amount of seed required would be too great. For field culture I therefore practice selecting the largest specimens for seed and cut them into one and two eye pieces.

### *Hills or Drills*

is the next question to be considered. This is simply a question of land against labor. A third more potatoes may readily be grown per acre by drill culture, but a third more labor will be required to produce them.

### *Constituents of a Potato Crop.*

In Johnson's "How Crops Grow," 1,000 lbs. of potato tubers are said to contain 5 6-10 lbs. of potash and 1 8-10 lbs. of phosphoric acid. At 60 lbs. to the bushel, a crop of 300 bushels of potatoes would weigh 18,000 lbs. — containing 100 8-10 lbs. of potash and 32 4-10 lbs. of phosphoric acid. As the tops are always returned to the soil nothing is lost by them. They contain, however, much less potash and phosphoric acid than the tubers weight for weight. Other authorities give the amounts much greater than this. Potash, therefore, from the part it plays in the formation of starch in the tuber and growth of tops or vines, seems to be one of the most necessary ingredients of a compound to be applied to help in the formation of a crop of potatoes; and if not already existing in sufficient quantities must in some manner be supplied. Ashes, German potash salts, muriate of potash, and various commercial substances are frequently used to supply this deficiency in worn soils. But I find that where any of them are used, to produce the best results they must be used in connection with vegetable matter of some kind, such as a good clover sod turned under, or a coating of stable ma-

nure, to loosen the soil and give it a proper mechanical composition. And further, they must be spread broadcast and thoroughly mixed with the soil by harrowing — for if placed directly in the hill without mixing thoroughly with the soil, there is great danger of giving an over-dose and killing the young potato shoots outright.

Should they be fortunate enough to escape this fate, if not well-mixed, and the season be in the east dry, the potatoes will at best be but a scabby lot.

The average yield of potatoes in this country is, I think, according to census returns, less than 100 bushels per acre, yet there is vastly more profit and pleasure in producing them at the rate of 300 or 400 bushels per acre, and until our farmers succeed in obtaining this yield they have yet something to learn about growing potatoes.

If the fertility of your soil is to be maintained by the application of stable manures, as it is in a great majority of instances in this country, it should be applied the year previous to occupying the ground with potatoes, as fresh manures have a tendency to produce potato rot. It is by no means a direct cause for the disease, but tends to stimulate them into a condition by which they are more liable to be affected. There has, during the past few years, been a great deal of investigation and discussion going on in England to determine, if possible, the cause and cure for the disease known as potato rot, which attacks the potatoes before they are fully mature. I do not think that a definite cure has been or soon will be determined upon; but the results of the investigation go to show that *new* and vigorous varieties are much less frequently attacked than those which have been grown for years until weakened and degenerated; also, that potatoes planted upon land which is thoroughly underdrained are much less subject to the disease than upon undrained lands in which a heavy clay subsoil holds too much water in the hills during the hot weather of July and August. The liability of potatoes to decay after being dug and stored is, in my opinion, dependent more upon the manner in which they are handled than upon any predisposing cause.

Potatoes which are intended for keeping for any considerable length of time absolutely require very careful handling. Many growers of potatoes act very unwisely in this respect. They gather their potatoes up and pour them carelessly into a wagon body, draw them to the cellar, then proceed to shovel them out, cutting and bruising without regard, and perhaps pitch them down a chute, as they would coals, into the cellar; then they are astonished to find that they are rotting in the pile before spring!

Some potato growers, after having had experience similar to this, sagely conclude that potatoes must not be dug and stored in cellars until late in the fall! My own practice is to dig them when ripe, frequently in August, and place them carefully in barrels, in the field, as soon as the sun has shone upon them long enough to dry them off. The barrels are then carefully transported to the cellar

and packed away, the potatoes remaining in them. The cellar should be dry and dark, and *well ventilated*. It should be so arranged that a door or large window can be opened at any time, upon two opposite sides, so that a draught of air may be made to circulate freely. This airing should be attended to, in order to keep the temperature low enough to prevent the tubers from sprouting.

I shipped potatoes to Delaware for late planting, after the middle of last June, which had been kept in this manner since the previous August without being once handled over, and it was at this late date scarcely necessary to look them over, as none had decayed, and the eyes but slightly started.

The great importance of keeping eating potatoes entirely from the light is under-estimated by many house-keepers. The chemical action of light upon potatoes will, in a very short time, produce a change within them which renders them unfit for food. If only exposed for a few hours to a strong light the quality will be very materially injured.

A number of very valuable new varieties have been disseminated within the last two or three years and others are being rapidly brought out. I annually plant over one hundred varieties, consisting of standard sorts and most of the *newer* introductions. A few hills of each are planted side by side, in a trial patch, and given, as far as possible, an equal chance in all respects. Thus I am enabled to note the great difference in the vigor and productiveness between the old and new varieties more readily than most growers. The specimens in the collection which I have had on exhibition at the fair grounds this week were mainly selected from a plot containing but ten hills of each variety, planted with but one eye in each hill. They are therefore selected from a comparatively small quantity of each variety. A duplicate collection of the whole number has also been taken from the same plot, which is now on exhibition at the Pennsylvania State Fair, at Philadelphia.

The seed potatoes which were planted to produce these were the identical specimens which I exhibited at your fair at Elmira last season.

Among the newer varieties shown last season, the *Early Ohio* and *Burbank Seedling* have fully maintained the favorable opinions which I then held for them. The *Genesee County King* also continues to please, and will, no doubt, become popular. Of the more recent introductions, the *Early Success*, *Early Williston*, *Beauty of Hebron* and *Mammoth Pearl* are the most promising that I have tested. The latter (the *Mammoth Pearl*) is one of the most vigorous varieties that I have ever grown. The vines come up large and strong in the beginning, and continue to grow most rampantly until they will completely cover the ground, even when planted four feet apart each way.

The potato-bugs will, of course, eat them, but they grow so rapidly that their ravages do not seem to injure the potatoes in the least.

The tubers are nearly round, large and very white. They are



solid and sound to the center. They seem so vigorous and productive that they must become popular; yet having grown them but a single season, and in but limited quantity, I cannot say they will be faultless, as they may yet disappoint me.

A couple of years ago, I obtained a large red seedling from the originator which gave me in every way much satisfaction. I grew a limited quantity of them last season and sent them out under the name of *Triumph*, which seemed very appropriate. B. K. Bliss & Sons, of New York, at the same time offered a new variety under the same name, which has occasioned some confusion. I have therefore decided to hereafter call my seedling the *La Plume*, after the town in which my seed farms are located.

In selecting a variety the grower must cater to the tastes of his market. The Albany market prefers a white potato. The Prince Albert was a favorite in it for years. The Burbank seedling must, therefore, prove a real acquisition in that region, inasmuch as it very closely resembles that popular old standard in form and color, while in many respects it is a better potato to-day than the Prince Albert ever was.

In Scranton, Pa., and in fact in most other coal-mining towns in which the population consists greatly of Irish and Welsh, a red potato is demanded. The "Chili" has been their standard for a number of years, and while the Rose class will sell quite readily, a heartier, coarser grained and redder variety is greatly preferred.

Brownell's Beauty was of the right color and shape to suit here, but on account of its tendency to rot, of late, it has rapidly gone out of cultivation.

The Snowflake is by many regarded as the finest in quality of any variety now cultivated. When well grown it is also one of the handsomest in appearance. It requires very rich, loose soil and light seeding—single eyes being preferable, as it is naturally inclined to set too many tubers, which crowd each other and do not attain their full size.

The Early Ohio is a fine productive sort. Every person who has tested it, so far as I know, allows that it is a week or ten days ahead of Early Rose in maturing. It requires a rich soil, as the vines are rather dwarf in their habit. The tubers are nearly all of marketable size and most excellent in quality. Mr. Brownell, of Vermont, sent me two new seedlings for trial last season which promise well. Both are smooth, white, early varieties. They are named Early Success and Early Williston. Both are deserving of further trial.

The *Beauty of Hebron* was widely disseminated in small lots last spring. In shape the tubers somewhat resemble the New York Late Rose. Their color is lighter and season a little earlier. So far as I can judge it is a capital variety. Probably a seedling of the Rose.

The Superior is a beautiful long red variety. It is remarkably smooth, sound and brittle. Though not very late in maturing the tubers keep in the best condition for late spring use of any variety I grow.

The excitement caused by the Colorado beetle has greatly subsided within the last two years. Our largest growers now pay but little attention to it. Many have discarded Paris Green entirely. The old beetles, or "seed bugs," as they are termed, are destroyed wherever found at the first hoeing, after which but little attention is paid to them. Like most other noxious insects they have parasitic enemies which have increased to such an extent as to materially check their ravages. Potatoes are in price periodically and alternately high and low. Like the patent safety-valve on a steam engine, this matter regulates itself. When they bring a good price, in market in spring, our farmers refuse to sell, and plant all they can manage. This produces a surplus and the lack of demand runs the price to a point below the actual cost of production. This disheartens the growers and they with one accord conclude "potatoes don't pay," and refuse to plant more than they want for their own use. Unlike a crop of grain, the surplus of one season cannot be carried over to make up the deficiency of the next. So they have their "ups and downs," and the only safe way for a potato grower is to either go by the rule of contrary, or to plant a stated amount each year regardless of the prospects.

The present has been or *is* a great potato season. A large acreage was planted and the crop is generally good throughout the Northern and Eastern States. They have already been sold in the Scranton market as low as twenty-five cents per bushel. I would much rather buy than sell at this price, as I am confident that any *good, early variety*, such as the Early Ohio, will be in good demand before another planting season rolls around. There is certainly but a limited quantity of early varieties, which are pure and good for seed, in existence, and those who have them may confidently look for an advance in prices. The reason is that they were not to be had last spring for planting, and as the price was very fair and money scarce, they were thrown upon the market as soon as fit for eating.

I also hear considerable complaint of *rot* in different sections, so that I would advise those having good potatoes not to waste them because they are now cheap.

# AWARDS

AT THE

THIRTY-NINTH ANNUAL CATTLE SHOW AND FAIR OF THE NEW YORK STATE AGRICULTURAL SOCIETY, HELD AT UTICA, SEPTEMBER 8TH TO SEPTEMBER 12TH, 1879.

## CATTLE.

### *Shorthorns — Shorthorn Herd Prize.*

- Thomas L. Harison, Morley, N. Y., large gold medal. Bull, Eighth Baron Morley, red and white, bred by exhibitor, calved December 12, 1874, sire Saladin (35461), dam Tuberoze 40 by Zanoni (37700), gr. d. Tuberoze 4th by Wolviston (21125).  
 Cow Bonny Red Rose, 2d, red and white, bred by Avery & Murphey, Detroit, Mich., calved October 12, 1874, sire Twenty-third Duke of Airdrie 19393, dam Bonny Red Rose by Major Duncan 5927, gr. d. Bonny Lass by Master Miller 693.  
 Heifer Lady Laura, roan, bred by exhibitor, calved March 9, 1877, sire Eighth Baron Morley 28537, dam Lady Fanny by Second Baron Morley 13427, gr. d. Lady Gertrude by Saladin (35461).  
 Heifer Salvia 4th, red and white, bred by exhibitor, calved March 12, 1877, sire Second Baron Morley 13427, dam Salvia by Saladin 10938, gr. d. Rosalie by Lord Derby 4949.  
 Heifer Hannah, roan, bred by exhibitor, calved May 22, 1877, sire Saladin (35461), dam Helena 2d by Mosstrooper (34877), gr. d. Helena by Lord Oxford (20214).  
 Heifer Princess Sale, roan, bred by exhibitor, calved February 22, 1878, sire Eighth Baron Morley 28537, dam Princess of Oxford 3d by Saladin 10938, gr. d. Princess of Oxford by Earl of Oxford 8072.

### *Bulls over Three Years Old.*

- Thomas L. Harison, Morley, N. Y., first prize, \$50. Eighth Baron Morley, red and white, bred by exhibitor, calved December 12, 1874, sire Saladin (35461), dam Tuberoze 4th by Zanoni (37700), gr. d. Tuberoze 4th by Wolviston (21125).  
 Samuel Campbell, New York Mills, N. Y., second prize, \$25. Knightley Duke 2d, red, bred by exhibitor, calved May 18, 1876, sire Seventh Lord Oxford 17586, dam Lady Knightley 4th by Fourth Duke of Geneva 7931, gr. d. Lady Knightley 2d by Third Duke of Geneva (23753).

*Bulls Two Years Old.*

- Daniel B. Haight, Dover Plains, N. Y., first prize, \$40. Baron of Brookdale, red, bred by exhibitor, calved March 6, 1877, sire Third Baron of Lyonsdale 18957, dam Lady Mary by Hotspur (31393), gr. d. Baroness by Barrington (30501).
- Samuel Campbell, New York Mills, N. Y., second prize, \$20. Knightley Duke 3d, roan, bred by exhibitor, calved March 21, 1877, sire Seventh Lord Oxford 17586, dam Lady Knightley 4th by Fourth Duke of Geneva 7931, gr. d. Lady Knightley 2d by Third Duke of Geneva (25753).

*Bulls One Year Old.*

- Harris Lewis & Son, Frankfort, N. Y., first prize, \$30. Twenty-second Prince of Herkimer, roan, bred by exhibitor, calved April 1, 1878, sire Second Prince of Herkimer 24417, dam Lady Mary of Herkimer by Prince of Herkimer 15211, gr. d. Lady Mary 2d by Duke of Putney 6686.
- T. L. Harison, Morley, N. Y., second prize, \$15. Fourteenth Baron Morley, red and white, bred by exhibitor, calved March 16, 1878, sire Eighth Baron Morley 28537, dam Lady Becky by Saladin (35461), gr. d. Rosette by Oxford Lad (24713).

*Bull Calves.*

- D. B. Haight, Dover Plains, N. Y., first prize, \$10. Fourth Baron of Brookdale, red, bred by exhibitor, calved February 25, 1879, sire Baron of Brookdale 28511, dam Lady Mary 10th by Earl of Seaham 8077, gr. d. Lady Mary 2d by Climax 5453.
- D. B. Haight, Dover Plains, N. Y., second prize, \$5. Napier, roan, bred by exhibitor, calved January 1, 1879, sire Third Baron of Lyonsdale 18957, dam Red Rose 20th by Mariner 5933, gr. d. Red Rose 7th by Highflyer 578.

*Cows over Three Years Old.*

- T. L. Harison, Morley, N. Y., first prize, \$40. Bonny Red Rose 2d, red and white, bred by Avery & Murphy, Detroit, Mich., calved October 12, 1874, sire Twenty-third Duke of Airdrie 19393, dam Bonny Red Rose by Major Duncan 5927, gr. d. Bonny Lass by Master Miller 693.
- Benjamin Fellows, Clifton, N. Y., second prize, \$20. Niobe 1st, red with a little white, bred by Judson Howard, Mendon, N. Y., calved January 21, 1873, sire Major, 10425, dam Niobe by Clifton Duke 2d 7711, gr. d. Nannie Williams 10th by Duke of Airdrie 2743.

*Heifers Two Years Old.*

- T. L. Harison, Morley, N. Y., first prize, \$30. Salvia 4th, red and white, bred by exhibitor, calved March 12, 1877, sire Second

Baron Morley 13427, dam Salvia by Saladin 10938, gr. d. Rosalie by Lord Derby 4949.  
 T. L. Harison, Morley, N. Y., second prize, \$15. Hannah, roan, bred by exhibitor, calved May 22, 1877, sire Saladin (35461), dam Helena 2d by Mosstrooper (34877), gr. d. Helena by Lord Oxford (20214).

*Heifers One Year Old.*

Benjamin Fellows, Clifton, N. Y., first prize, \$20. Niobe 2d, red, bred by exhibitor, calved March 7, 1878, sire Treble Gloster 7331, dam Niobe 1st by Major 10425, gr. d. Niobe by Clifton Duke 2d 7711.

Benjamin Fellows, Clifton, N. Y., second prize, \$10. Niobe 3d, red, bred by exhibitor, calved March 25, 1878, sire Treble Gloster 7331, dam Niobe by Clifton Duke 2d 7711, gr. d. Nannie Williams 10th by Duke of Airdrie 2743.

*Heifer Calves.*

Benjamin Fellows, Clifton, N. Y., first prize, \$10. Prairie Bell, red with white marks, calved October 24, 1878, bred by exhibitor, sire Treble Gloster 7331, dam Prairie Blossom by Royal Crown 10916, gr. d. Prairie Lass by Scotchman 7253.

Daniel B. Haight, Dover Plains, N. Y., second prize, \$5. Constance of Brookdale 3d, red and white, bred by exhibitor, calved September 10, 1878, sire Third Baron of Lyonsdale 18967, dam Constance 5th by Earl of Seaham 8077, gr. d. Constance 3d by Clifton Duke (23580).

J. ASHWORTH, Ottawa, Canada,  
 RICHARD CHURCH, Belvidere, N. Y.

*Devons — Devon Herd Prize.*

Joseph Hilton, New Scotland, N. Y., large gold medal. Bull Crown Prince, bred by exhibitor, calved November 25, 1875, sire Prince of Wales 652, dam Edith 6th by Prince of Wales 652, gr. d. Edith 3d by Sachem (517).

Cow Fanny, bred by exhibitor, calved November 10, 1871, sire Prince of Wales 652, dam Edith 3d by Sachem (517), gr. d. Edith, imported by Lewis G. Morris.

Cow Edith 6th, bred by exhibitor, calved November 5, 1872, sire Prince of Wales 652, dam Edith 3d by Sachem (517), gr. d. Edith, imported by Lewis G. Morris.

Cow Edith 12th, bred by exhibitor, calved December 13, 1875, sire Prince of Wales 652, dam Edith 4th by Prince of Wales 652, gr. d. Edith 2d by Sachem (517).

Heifer Belle 11th, bred by exhibitor, calved August 23, 1877, sire Prince of Wales 11th 1025, dam Belle 5th by Prince of Wales 652, gr. d. Belle 4th by Prince of Wales 652.

Heifer Edith 13th, bred by exhibitor, calved December 11, 1877,

sire Prince of Wales 11th 1025, dam Edith 7th by Prince of Wales 652, gr. d. Edith 2d by Sachem (517).

*Bulls over Three Years Old.*

Joseph Hilton, New Scotland, N. Y., first prize, \$50. Crown Prince, bred by exhibitor, calved November 25, 1875, sire Prince of Wales 652, dam Edith 6th by Prince of Wales 652, gr. d. Edith 3d by Sachem (517).

Walter Cole, Batavia, N. Y., second prize, \$25. Cole's Puritan 3d, bred by exhibitor, calved February 21, 1875, sire Lovely's Huron 3d 591, dam Helena 34th by Iroquois 564, gr. d. Helena 33d by Comet 22.

*Bulls Two Years Old.*

A. F. Bronson, Vernon, N. Y., second prize, \$20. Lord Nelson 2d, bred by Truman Baker, Earlville, N. Y., calved March 20, 1877, sire Lord Nelson 949½, dam Edith by Chenango 463, gr. d. Alida by Empire (424 H.).

*Bulls One Year Old.*

Walter Cole, Batavia, N. Y., first prize, \$30. Wanda's Puritan, bred by exhibitor, calved March 18, 1878, sire Cole's Puritan 2d 798, dam Wanda 2d by Queen Anne's Huron 320, gr. d. Lovely 18th by Young Exeter (765).

A. F. Bronson, Vernon, N. Y., second prize, \$15. Brant, bred by exhibitor, calved April, 1878, sire Litchfield 947, dam Cherry by Young Baltimore (599 H.), gr. d. Flora by Sir Walter Raleigh (560 H.).

*Bull Calves.*

Joseph Hilton, New Scotland, N. Y., first prize, \$10. Prince of Wales 20th, bred by exhibitor, calved December 12, 1878, sire Crown Prince 809, dam Edith 9th by Prince of Wales 652, gr. d. Fanny by Prince of Wales 652.

A. F. Bronson, Vernon, N. Y., second prize, \$5. Oneida, bred by exhibitor, calved March 31, 1879, sire Doctor 819½, dam Flora by Grant 533, gr. d. Tilt by Dandy 191.

*Cows over Three Years Old.*

Joseph Hilton, New Scotland, N. Y., first prize, \$40. Edith 6th, bred by exhibitor, calved November 5, 1872, sire Prince of Wales 652, dam Edith 3d by Sachem (517), gr. d. Edith, imported by Lewis G. Morris.

Joseph Hilton, New Scotland, N. Y., second prize, \$20. Edith 12th, bred by exhibitor, calved December 13, 1875, sire Prince of Wales 652, dam Edith 4th by Prince of Wales 652, gr. d. Edith 2d by Sachem (517).

*Heifers Two Years Old.*

Joseph Hilton, New Scotland, N. Y., first prize, \$30. Belle 11th,

bred by exhibitor, calved August 23, 1877, sire Prince of Wales 11th 1025, dam Belle 5th by Prince of Wales 652, gr. d. Belle 4th by Prince of Wales 652.

- A. F. Bronson, Vernon, N. Y., second prize, \$15. Litchfield Belle bred by exhibitor, calved February 20, 1877, sire Doctor 819½, dam Flora by Grant 533, gr. d. Tilt by Dandy 191.

### *Heifers One Year Old.*

Walter Cole, Batavia, N. Y., first prize, \$20. Puritan Maid, bred by exhibitor, calved April, 1878, sire Duke of Flitton 9th 838, dam Helena 34th by Iroquois 564, gr. d. Helena 33d by Comet 22.

- A. F. Bronson, Vernon, N. Y., second prize, \$10. Belle of Oneida, bred by exhibitor, calved May 6, 1878, sire Doctor 819½, dam Emma by Tasso 848, gr. d. Eva by Bloomfield 169.

### *Heifer Calves.*

Joseph Hilton, New Scotland, N. Y., first prize, \$10. Edith 17th, bred by exhibitor, calved March 27, 1879, sire Crown Prince 809, dam Edith 6th by Prince of Wales 652, gr. d. Edith 3d by Sachem (517).

- A. F. Bronson, Vernon, N. Y., second prize, \$5. Little Buttercup, bred by exhibitor, calved March 1, 1879, sire Doctor 819½, dam Cherry 3d by Mohawk 610, gr. d. Cherry by Young Baltimore (599) H.

R. H. VAN RENSSELAER, Morris, N. Y.  
ALFRED DEGRAFF, Fonda, N. Y.

### *Herefords — Hereford Herd Prize.*

John Merryman, Hayfields, Md., large gold medal. Bull Illinois, red, white face, bred by T. L. Miller, Beecher, Ill., calved August 3, 1875, sire Success (5031), dam Kate by John Bull (3885), gr. d. Queen of the West by Merryman (4787).

Cow Giantess, red, white face, bred by John Henry Arkwright Hampton Green, Herefordshire, England, calved August 26, 1868, sire Sir Oliver 2d (1733), dam Gay Lass by Riff Raff (1052), gr. d. Gaily by Quicksilver 2d.

Cow Belle McAlpine, red, white face, bred by exhibitor, calved December 21, 1871, sire Sir Richard 2d (4984), dam Hatty by Curly (801), gr. d. Miss Tully.

Heifer Etta, red, white face, bred by exhibitor, calved October 27, 1876, sire Canadian (4394), dam Bell McAlpine by Sir Richard 2d (4984), gr. d. Hattie by Curly (801).

Heifer Princess Charlotte, red, white face, bred by exhibitor, calved April 8, 1877, sire Sir Richard 2d (4984), dam Giantess by Sir Oliver 2d (1733), gr. d. Gay Lass by Riff Raff (1052).

Heifer Princess Louise 2d, red, white face, bred by exhibitor, calved November 10, 1877, sire Sir Richard 2d (4984), dam Giantess by Sir Oliver 2d (1733), gr. d. Gay Lass by Riff Raff (1052).

*Bulls over Three Years Old.*

Erastus Corning, Albany, N. Y., first prize, \$50. Comus, red, with white face, bred by Thomas Turner, Pembroke, England, calved July 21, 1872, sire Provost (4067), dam Kathlina by Bolingbroke (1886), gr. d. Redwing by Felix (953).

John Merryman, Hayfields, Md., second prize, \$25. Illinois, red, white face, bred by T. L. Miller, Beecher, Ill., calved August 6, 1875, sire Success (5031), dam Kate by John Bull (3885), gr. d. Queen of the West by Merryman (4787).

*Bulls One Year Old.*

John Merryman, Hayfields, Md., first prize, \$30. Stonie Williams, red, white face, bred by exhibitor, calved August 22, 1878, sire Illinois (5395), dam Belle M'Alpine by Sir Richard 2d (4984), gr. d. Hattie by Curly (801).

*Bull Calves.*

John Merryman, Hayfields, Md., first prize, \$10. Duke of Connaught, red, white face, bred by exhibitor, calved November 1, 1878, sire Illinois (5395), dam Princess Victoria by Sir Richard 2d (4984), gr. d. Giantess by Sir Oliver 2d (4733).

*Cows over Three Years Old.*

Erastus Corning, Albany, N. Y., first prize, \$40. Victoria 6th, red, with white face, bred by exhibitor, calved June 12, 1874, sire Taurus, dam Victoria 5th by S. Goddard, gr. d. Victoria 4th by Cardinal Wiseman.

Erastus Corning, Albany, N. Y., second prize, \$20. Marchioness 2d, red, with white face, bred by exhibitor, calved April, 1869, sire Major, dam Marchioness by Washington, gr. d. Lady, imported by exhibitor.

*Heifers Two Years Old.*

John Merryman, Hayfields, Md., first prize, \$30. Princess Charlotte, red, white face, bred by exhibitor, calved April 8, 1877, sire Sir Richard 2d (4984), dam Giantess by Sir Oliver 2d (1733), gr. d. Gay Lass by Riff Raff (1052).

Erastus Corning, Albany, N. Y., second prize, \$15. Topsy Turvy, red, with white face, bred by exhibitor, calved March 13, 1877, sire Comus, dam Topsy by Taurus, gr. d. Marchioness 2d by Major.

*Heifers One Year Old.*

John Merryman, Hayfields, Md., first prize, \$20. Princess Louise 2d, red, white face, bred by exhibitor, calved November 10, 1877, sire Sir Richard 2d (4984), dam Giantess by Sir Oliver 2d (1733), gr. d. Gay Lass by Riff Raff (1052).



*Heifer Calves.*

John Merryman, Hayfields, Md., first prize, \$10. Dorcas 2d, red, white face bred by exhibitor, calved October 6, 1878, sire Illinois (5395), dam Dorcas by Sir Richard 2d (4984), gr. d. Agnes by Admiral (2375).

Erastus Corning, Albany, N. Y., second prize, \$5. Edna, red, with white face, bred by exhibitor, calved February 9, 1879, sire Comus, imported, dam Victoria 6th by Taurus, gr. d. Victoria 5th by S. Goddard.

B. H. VAN RENSSELAER, Morris, N. Y.  
ALFRED DeGRAFF, Fonda, N. Y.

*Ayrshires — Ayrshire Herd Prizes.*

James F. Converse, Woodville, N. Y., large gold medal. Bull Woodville Chief, white and red, bred by M. Robertson in Scotland, calved May, 1870, sire General Lee, dam Beauty 2d.

Cow Beulah, mostly red and white, bred by R. Caldwell in Scotland, calved June, 1869, sire Geordie, dam Queen.

Cow Peerless, red and white, bred by Robert Orr in Scotland, calved March, 1871, sire Tramp, dam Kitty Clyde.

Cow Ocean Belle 2d, red and white, bred by exhibitor, calved April, 1872, sire Woodville Chief 1542, dam Ocean Belle (imported) by Trumpeter, gr. d. Dosh by Doctor.

Heifer Molly Kimball, red and white spotted, bred by exhibitor, calved November 9, 1877, sire Fearnot 1134, dam Ocean Belle 2d by Woodville Chief 1542, gr. d. Ocean Belle, imported.

Heifer Christie, white and red, bred by exhibitor, calved April 22, 1878, sire Gold Dust 2015, dam Miss Clara by Woodville Chief, 1542, gr. d. Bright Eyes by John Gilpin 222.

*Bulls over Three Years Old.*

Eugene Ham, Verbank, N. Y., first prize, \$50. Edgewood, red and white, bred by John R. Stuyvesant, Poughkeepsie, N. Y., calved June 3, 1874, sire 247 Argyle, dam Josephine by 111 Ivanhoe, gr. d. Jessie by 10 Baldy.

Frank D. Curtis, Charlton, N. Y., second prize, \$25. Seventy-six, dark red and white, bred by exhibitor, calved July 4, 1876, sire Donald Dinnie, 1074, dam Polyanthus by St. Cuthbert 877, gr. d. Marian by Tam 72.

*Bulls Two Years Old.*

Eugene Ham, Verbank, N. Y., first prize, \$40. McWhirter, red and white, bred by S. M. & D. Wells, Wethersfield, Conn., calved March 6, 1877, sire 324 Fortune, dam Amy by 672 Morton, gr. d. Dolly 3d by 453 Rob Roy.

*Bulls One Year Old.*

Samuel Campbell, New York Mills, N. Y., first prize, \$30. Laird

Craigie, red and white, bred by exhibitor, calved March 29, 1878, sire 675 Nappy, dam Lady Clyde imported by Wolcott & Campbell in 1870.

James F. Converse, Woodville, N. Y., second prize, \$15. Wait-and-Win, red and white, bred by exhibitor, calved April, 1878, sire Woodville Chief 1542, dam Eye-Bright by Gen. Grant 176, gr. d. Bright Eyes by John Gilpin 222.

#### *Bull Calves.*

James F. Converse, Woodville, N. Y., first prize, \$10. Camper, red and white, bred by exhibitor, calved November, 1878, sire Woodville Chief 1542, dam Molly Brooks by John Gilpin 222. gr. d. Dewdrop by Kilburn 229.

Samuel Campbell, New York Mills, N. Y., second prize, \$5. —, red and white, bred by exhibitor, calved January 31, 1879, sire 675 Nappy, dam Peggy by 142 Lord Clyde, gr. d. Maggie by 10 Baldy.

#### *Cows over Three Years Old.*

James F. Converse, Woodville, N. Y., first prize, \$40. Beulah, mostly red, bred by R. Caldwell in Scotland, calved June, 1869, sire Geordie, dam Queen.

Samuel Campbell, New York Mills, N. Y., second prize, \$20. Lady Clyde 4th, red and white, bred by exhibitor, calved April 23, 1875, sire 148 Lucknow, dam Lady Clyde, imported by Wolcott & Campbell in 1870.

#### *Heifers Two Years Old.*

Eugene Ham, Verbank, N. Y., first prize, \$30. Madge Morton 3d, light red and white, bred by exhibitor, calved May 16, 1877, sire 318 Edgewood, dam Madge Morton by 328 Gen. Tilton, gr. d. Madge by 109 Irvine.

James F. Converse, Woodville, N. Y., second prize, \$15. Jean Woodville, red and white, bred by exhibitor, calved March 30, 1877, sire Pilot 1675, dam Miss Clara by Woodville Chief 1542, gr. d. Bright Eyes by John Gilpin 222.

#### *Heifers One Year Old.*

James F. Converse, Woodville, N. Y., first prize, \$20. Christie, white and red, bred by exhibitor, calved April 22, 1878, sire Gold Dust 2015, dam Miss Clara by Woodville Chief 1542, gr. d. Bright Eyes by John Gilpin 222.

James F. Converse, Woodville, N. Y., second prize, \$10. Molly Kimball, red and white spotted, bred by exhibitor, calved November 9, 1877, sire Fearnot 1134, dam Ocean Belle 2d by Woodville Chief 1542, gr. d. Ocean Belle, imported.

#### *Heifer Calves.*

Eugene Ham, Verbank, N. Y., first prize, \$10. Miss Dolly's

Daughter, red and white, bred by exhibitor, calved March 16, 1879, sire 318 Edgewood, dam Miss Dolly by 490 Sultan, gr. d. Dolly by 286 Dandy 5th.

Stryker & Jones, Rome, N. Y., second prize, \$5. Lady Brown, white and red, bred by exhibitor, calved March 20, 1879, sire Kilmarnock 2d, dam Spotted Beauty 2d by 127 Kilmarnock, gr. d. Spotted Beauty by 182 Ploughboy.

EDWARD D. PEARCE, Providence, R. I.,  
S. M. WELLS, Wethersfield, Conn.

*Holsteins — Holstein Herd Prize.*

Smiths & Powell, Syracuse, N. Y., large gold medal. Bull Uncle Tom, black and white, bred by Gerrit S. Miller, Peterboro, N. Y., calved April 17, 1875, sire Rip Van Winkle 35, dam Topsy by Hollander 20, gr. d. Dowager, imported by G. S. Miller.

Cow Ægis, black and white, bred by Gerrit S. Miller, Peterboro, N. Y., calved October 2, 1873, sire Rip Van Winkle 35, dam Agoo, imported by G. S. Miller.

Cow Porcelain, white and black, bred by A. D. Goede, in Holland, calved in 1874, imported by exhibitors in 1878.

Heifer Sappho, black and white, bred by Gerrit S. Miller, Peterboro, N. Y., calved January 15, 1877, sire Pluto 133, dam Juniata by Rip Van Winkle 35, gr. d. Juno by Hollander 20.

Heifer Netherland Queen, black and white, bred by A. C. Koning, in Holland, calved March 26, 1877, imported by exhibitors in 1878.

Heifer Holland Beauty, black and white, bred by A. C. Koning in Holland, calved April 3, 1877, imported by exhibitors in 1878.

*Bulls over Three Years Old.*

Smiths & Powell, Syracuse, N. Y., first prize, \$50. Uncle Tom, black and white, bred by Gerrit S. Miller, Peterboro, N. Y., calved April 17, 1875, sire Rip Van Winkle 35, dam Topsy by Hollander 20, gr. d. Dowager, imported by G. S. Miller.

Stryker & Jones, Rome, N. Y., second prize, \$25. Fourth Prince of Orange, black and white, bred by the Oneida Community, Oneida, N. Y., calved February 12, 1876, sire Prince of Orange 138, dam Midwould 15th by Texelaar 6th 44, gr. d. Midwould 2d by Second Dutchman 37.

*Bulls One Year Old.*

Smiths & Powell, Syracuse, N. Y., first prize, \$30. "Beaconsfield," black and white, bred by Jan Wortel, in Holland, imported by exhibitors, calved March 25, 1878, sire Keep (52).

H. L. Brace, West Winfield, N. Y., second prize, \$15. Second Lad of Twisk, black and white, bred by the Unadilla Valley Stock Breeders Association, West Edmeston, N. Y., calved April 3, 1878, sire Burgomaster (27) dam Maid of Twisk, imported.

*Bull Calves.*

L. L. Wight, Whitestown, N. Y., first prize, \$10. Paul Bleecker, black and white, bred by Unadilla Valley Stock Breeders Association, calved March 29, 1878, sire Paul Potter, imported, dam Siitje Bleecker, imported.

Smiths & Powell, Syracuse, N. Y., second prize, \$5. Farmer Boy, black and white, bred by exhibitors, calved March 19, 1879, sire Uncle Tom 163, dam Holland Beauty, imported by exhibitors.

*Cows over Three Years Old.*

Smiths & Powell, Syracuse, N. Y., first prize, \$40. Egis, black and white, bred by Gerrit S. Miller, Peterboro, N. Y., calved October 2, 1873, sire Rip Van Winkle 35, dam Agoo, imported by G. S. Miller.

Stryker & Jones, Rome, N. Y., second prize, \$20. Lea, black and white, bred in North Holland, calved April, 1871, sire Weder-kind, dam Eva, imported by John H. Comer in 1874.

*Heifers Two Years Old.*

Smiths & Powell, Syracuse, N. Y., first prize, \$30. Netherland Queen black and white, bred by A. C. Koning in Holland, calved March 26, 1877, imported by exhibitors in 1878.

Stryker & Jones, Rome, N. Y., second prize, \$15. Lea 2d, black and white, bred by John Stryker, Rome, N. Y., calved January 6, 1877, sire Prince of Orange 138, dam Lea, imported by John H. Comer.

*Heifers One Year Old.*

Smiths & Powell, Syracuse, N. Y., first prize, \$20. Pride of Friesland, black and white, bred by K. N. Kuipers in Holland, calved February 20, 1878, imported by exhibitors in 1879.

H. L. Brace, West Winfield, N. Y., second prize, \$10. Dora Bleecker 2d, black and white, bred by T. E. Whiting, Concord, Mass., calved February 18, 1878, sire Paul Potter (28), dam Dora Bleecker, imported.

*Heifer Calves.*

Smiths & Powell, Syracuse, N. Y., first prize, \$10. Juniata 2d, black and white, bred by exhibitors, calved March 13, 1879, sire Uncle Tom 163, dam Juniata by Rip Van Winkle 35, gr. d. Juno by Hollander 20.

Stryker & Jones, Rome, N. Y., second prize \$5. Ella, black and white, bred by John Stryker, Rome, N. Y., calved January 28, 1879, sire Fourth Prince of Orange 246, dam Lea 2d by Prince of Orange 138, gr. d. Lea, imported by John H. Comer.

A superb display of Holsteins. Very much pleased with the Unadilla stock, sorry they were not entered for prizes.

JAMES NEILSON, New Brunswick, N. J.

I. P. ROBERTS, Ithaca, N. Y.

*Jerseys. Jersey Herd Prize.*

- John D. Wing, Millbrook, N. Y., large gold medal. Bull Babylon, solid dark, bred by E. R. Durkee, Babylon, N. Y., calved July 25, 1878, sire Jacob 1377, dam Echo 2d by Devilshoof 866, gr. d. Echo by Lord Nelson 860.
- Cow Maple Leaf, fawn with some white, bred by exhibitor, calved November 10, 1872, sire Ontario 865, dam Echo by Lord Nelson, 860, gr. d. Edith 2d, by Saturn 94.
- Cow Oak Leaf, dark fawn, bred by exhibitor, calved September 19, 1873, sire Devilshoof 866, dam Echo by Lord Nelson 860, gr. d. Edith 2d, by Saturn 94.
- Heifer Maple Blossom, fawn, bred by exhibitor, calved February 5, 1878, sire Niobe Duke 2364, dam Maple Leaf 2d by Pagan 1800, gr. d. Maple Leaf by Ontario 865.
- Heifer Hazel Witch, fawn and white, bred by Thos. J. Hand, Sing Sing, N. Y., calved May 3d, 1878, sire Medallist 2122, dam Witch Hazel 3d by Marius 760, gr. d. Witch Hazel by Southampton 117.
- Heifer Empresa 2d, dark gray, bred by Thomas J. Hand, Sing Sing, N. Y., calved June 11, 1878, sire Lord Lawrence 1414, dam Empresa by Marius 760, gr. d. Emblem, imported.

*Bulls Over Three Years Old.*

- Erastus Corning, Albany, N. Y., first prize, \$50. Stockwell, 3d, fawn gray, bred by John A. Godfrey, calved August, 1872, imported by exhibitor.
- H. & C. H. Holmes, Greenwich, N. Y., second prize, \$25. Rowley, gray and black, bred by Thomas H. Faile, West Farms, N. Y., calved February 23, 1875, sire Bismarck 1423, dam Edith 3d, by Jupiter 93, gr. d. Edith, imported by Richard M. Hoe.

*Bulls Two Years Old.*

- W. L. & W. Rutherford, Waddington, N. Y., first prize, \$40. Royal Dane, gray, bred by Moses Ellis, Framingham, Mass., calved June, 1877, sire Sweepstakes Duke 1905, dam Lady Dane by Sam Weller 14, gr. d. Princess 2d by McClellan 32.
- L. W. Ledyard, Cazenovia, N. Y., second prize, \$20. Felix Mas, fawn and white, bred by Chas. M. Beach, Hartford, Conn., calved July 24, 1877, sire Lord Francis 1857, dam Daisy Washington, by Lord Ogden 69, gr. d. Daisy by General Scott 46.

*Bulls One Year Old.*

- Erastus Corning, Albany, N. Y., first prize, \$30. Kenwood, solid color black points, bred by exhibitor, calved March 15, 1878, sire Stockwell 3d 2770, dam Maid of St. Owens, imported.
- John D. Wing, Millbrook, N. Y., second prize, \$15. Babylon, solid dark, bred by E. R. Durkee, Babylon, N. Y., calved July 25, 1878, sire Jacob 1377, dam Echo 2d by Devilshoof 866, gr. d. Echo by Lord Nelson 860.

*Bull Calves.*

John D. Wing, Millbrook, N. Y., first prize, \$10. Fawn, bred by exhibitor, calved March 19, 1879, sire Niobe Duke 2364, dam Witch Hazel 3d by Marius 760, gr. d. Witch Hazel by Southampton 117.

Edwin Thorne, Millbrook N. Y., second prize, \$5. Solid light fawn, bred by exhibitor, calved December 19, 1878, sire Niobe Duke 2364, dam Alice Kelsey by Barney 1491, gr. d. Kate K., imported.

*Cows over Three Years Old.*

John D. Wing Millbrook, N. Y., first prize, \$40. Maple Leaf, fawn, with some white, bred by exhibitor, calved November 10, 1872, sire Ontario 865, dam Echo by Lord Nelson 860, gr. d. Edith 2d by Saturn 94.

Frank D. Curtis, Charlton, N. Y., second prize, \$20. Princess Caroline, mulberry fawn, cream and white, bred by exhibitor, calved July 8, 1871, sire Hero 840, dam Caroline 2d, imported.

*Heifers Two Years Old.*

C. R. Agnew, Palisades, N. Y., first prize, \$30. Delightsome, solid fawn, bred by exhibitor, calved March 30, 1877, sire Orpheus 1219, dam Mu by Palisades 803, gr. d. Maggie No. 2 by Suffolk 607.

W. L. & W. Rutherford, Waddington, N. Y., second prize, \$15. Hinda-Parker, dark brown, bred by H. D. Parker, Boston, Mass., calved March 12, 1877, sire Baron Booth 2150, dam Flora Temple, imported by Mr. Parker.

*Heifers One Year Old.*

L. W. Ledyard, Cazenovia, N. Y., first prize, \$20. Fernwood Gift, yellow, fawn and white, bred by George S. Ledyard, Cazenovia, N. Y., calved November 21, 1877, sire Flash 2532, dam Pride of Jersey 3d by Monitor 878, gr. d. Pride of Jersey, by Rob Roy 17.

Horatio B. Curran, Whiteston, N. Y., second prize, \$10. Charm, pale fawn, bred by exhibitor, calved March 23, 1878, sire Norwood 1077, dam Hoey 4th, by Ossipee 697, gr. d. Hoey, by Saturn 94.

*Heifer Calves.*

C. R. Agnew, Palisades, N. Y., first prize, \$10. Delightsome 2d, bred by exhibitor, calved January 1, 1879, sire Homeric 2798, dam Delightsome by Orpheus 1219, gr. d. Mu by Palisades 803.

John D. Wing, Millbrook, N. Y., second prize, \$5. Glimpsee 2d, fawn, bred by exhibitor, calved January 15, 1879, sire Niobe Duke 2364, dam Glimpsee by Cossack 1159, gr. d. Josephine Beacon by Touchstone 315.

Your committee beg leave to report that this has been the largest, and in their opinion the best exhibit of Jerseys ever held in this State. All fine. They had great difficulty in deciding, they all were so good, and in *such excellent condition*, a matter too frequently neglected by former exhibitors.

BENJ. L. SWAN, JR., Oyster Bay, N. Y.  
EDWARD BURNETT, Southborough, Mass.

*Guernseys—Bulls Two Years Old.*

L. W. Ledyard, Cazenovia, N. Y., second prize, \$20. Neptune, yellow, black and white, sired in Guernsey, calved at sea, April 25, 1877, sire Mr. Mansel's bull Payson, dam La Fontaine, imported.

*Bulls One Year Old.*

E. M. S. Nutting, Woodville, N. Y., first prize, \$30. Og, yellow and white, bred by Edward Norton, Farmington, Conn., calved April 19, 1878, sire Mallbrook 23, dam Princess, imported.  
L. W. Ledyard, Cazenovia, N. Y., second prize, \$15. Fernwood, yellow, fawn and white, sired in Guernsey, calved April 2, 1878, sire Mr. Manger's bull, dam Fernwood Fancy, imported.

*Cows over Three Years Old.*

L. W. Ledyard, Cazenovia, N. Y., first prize, \$40. Fernwood Fancy, yellow, fawn and white, bred by Elizabeth De Garis, St. Saviours, Guernsey, calved December, 1875.

*Heifers One Year Old.*

E. M. S. Nutting, Woodville, N. Y., first prize, \$20. Ceres, 2d, yellow and white, bred by Edward Norton, Farmington, Conn., calved July 4, 1878, sire Mr. Stromger's bull, in Guernsey, dam Ceres, imported.

*Heifer Calves.*

L. W. Ledyard, Cazenovia, N. Y., first prize, \$10. Pinafore, yellow, fawn and white, bred by exhibitor, calved February 2, 1879, sire Neptune 41, dam Kathleen, imported.

BENJ. L. SWAN, JR., Oyster Bay, N. Y.  
EDWARD BURNETT, Southborough, Mass.

*Cattle of any Kind—Milk Cows.*

Unadilla Valley Stock Breeders' Association, West Edmeston, N. Y., first prize, \$30. Jacoba Hartog, imported Holstein, black and white, bred by Jacob Hartog, in Beemster, North Holland, calved March 1, 1874, last calf April 20, 1879.

Unadilla Valley Stock Breeders' Association, West Edmeston, N. Y., second prize, \$15. Maid of Twisk, imported Holstein, black

and white, bred by F. Slot in North Holland, calved November, 1870, last calf March 8, 1879.

*Fat Oxen Over Four Years Old.*

John Merryman, Hayfields, Md., first prize, \$30. Hereford, bred by exhibitor, calved December 1, 1874, sire Sir Richard 2d (4984) dam Bohemian Maid by Admiral (2375).

*Fat Cows over Four Years Old.*

John Merryman, Hayfields, Md., first prize, \$30. Hereford, Queen of Athens, red, white face, bred by exhibitor, calved June 11, 1873, sire Sir Richard 2d (4984), dam Jeanie Clark, by Admiral (3375).

*Fat Heifers under Four Years Old.*

John Merryman, Hayfields, Md., first prize, \$30. Princess Victoria 2d, red, white face, bred by exhibitor, calved January 15, 1877, sire Canadian (4394), dam Princess Victoria by Sir Richard 2d (4894), gr. d. Giantess, by Sir Oliver 2d (1733).

Cattle called Holderness your committee think quite worthy of notice. They show very fair dairy qualities, both for milk and butter. We recommend them as a fine grade of cattle for all purposes.

Swiss — These cattle were new to your committee. We think them hardy, of fair dairying quality and might be crossed with other breeds with advantage.

JAMES WHIFFEN, Utica, N. Y.  
H. C. GREGORY, Unadilla, N. Y.

## HORSES.

Special prize for the best draught or agricultural stallion of any age or breed, \$100.

David J. McKnutt, Palmyra, N. Y., special prize, \$100. Young Champion, bay 16.3, six years, sire Malcolm, imported.

*Clydesdales and their Crosses — Stallions over Four Years Old.*

Smiths & Powell, Syracuse, N. Y., first prize, \$50. Donside Champion, brown, 16.2, eight years, imported, sire Sir Colin, dam Scottish Lass.

David J. McKnutt, Palmyra, N. Y., second prize, \$25. Young Champion, bay, 16.3, six years, sire Malcolm, imported.

*Stallions Three Years Old.*

Smiths & Powell, Syracuse, N. Y., first prize, \$40. Empire Duke, black, sire Duke of Argyle, dam Lady Thompson by Campsie Jock, gr. d. May by Old Carlisle.



*Stallions Two Years Old.*

Smiths & Powell, Syracuse, N. Y., first prize, \$30. Wellington, bay, sire Bold Buccleugh, dam Conqueress by Conqueror, gr. d. Diamond by Duke of Wellington.

*Stallions One Year Old.*

Smiths & Powell, Syracuse, N. Y., first prize, \$20. Climax, chestnut, sire King of the East, dam by Henderson's Clydesdale.

*Mares over Four Years Old.*

Smiths & Powell, Syracuse, N. Y., first prize, \$50. Highland Girl, bay, 16.2, six years, sire Oxford, dam by Robin Hood, gr. d. by an imported Clydesdale horse.

Smiths & Powell, Syracuse, N. Y., second prize, \$25. Diamond, gray, 16.1, four years, sire Wonderful Lad, dam by Comet, gr. d. by Highland Chief.

*Fillies Two Years Old.*

Smiths & Powell, Syracuse, N. Y., first prize, \$30. Lady Clyde, brown, sire Duke of Argyle, dam Lady McDonald by Campsie Jock.

*Fillies One Year Old.*

Smith & Powell, Syracuse, N. Y., first prize, \$20. Perfection, black, sire King of the East, dam Kate by Campsie Jock, gr. d. by Clark's Clydesdale.

*Percherons and their Crosses — Stallions over Four Years Old.*

Howard G. White, Syracuse, N. Y., first prize, \$50. Raspail, gray, 17, 4 years, bred by P. Sagot, Nogent-le-Rotrou, France, sire Pierriot, dam Couronne.

John H. Starin, Fultonville, N. Y., second prize, \$30. Baron Haussman, black, 17, 5 years, imported by E. A. Buck, New York.

*Stallions Two Years Old.*

Sanford Thayer, West Schuyler, N. Y., first prize, \$30. Roan, 15.2, by Babbitt's imported Malo out of a half-bred Percheron mare.

*Mares over Four Years Old.*

Howard G. White, Syracuse, N. Y., second prize, \$25. Chatton, gray, bred by Goupil Eduz, Nogent-le-Rotrou, France, sire Le Cœur Joli, dam Pauline.

*Fillies Three Years Old.*

Howard G. White, Syracuse, N. Y., first prize, \$40. Rustique, gray, bred by H. Guibet, Nogent-le-Rotrou, France, sire Margot, dam Rustique.

H. Langworthy, West Edineston, N. Y., second prize, \$20. Lady

Monarch, gray, bred by B. T. Babbitt, New York, sire Monarch, imported by M. W. Dunham, dam by Otsego Chief.

*Fillies Two Years Old.*

Wayne W. Thurstin, Sauquoit, N. Y., first prize, \$30. Roan, bred by exhibitor, sire B. T. Babbitt's Malo.

*Fillies One Year Old.*

Wayne W. Thurstin, Sauquoit, N. Y., first prize, \$20. Bred by exhibitor, sire B. T. Babbitt's Malo.

H. Langworthy, West Edmeston, N. Y., second prize, \$10. Miss Malo, gray, bred by B. T. Babbitt, sire Malo, imported by M. W. Dunham, dam by Otsego Chief.

*Thoroughbreds and their Crosses — Special Prize for the best Stallion of any age, \$150.*

Samuel Parson, Oxford Depot, N. Y., the prize, \$150. Happy Prince, bay, 15.2, 8 years, sire Happy Medium, dam by Vermont Morgan, gr. d. by American Eclipse.

*Stallions over Five Years Old.*

Samuel Parson, Oxford Depot, N. Y., first prize, \$70. Happy Prince, bay, 15.2, 8 years, sire Happy Medium, dam by Vermont Morgan, gr. d. by American Eclipse.

Smiths & Powell, Syracuse, N. Y., second prize, \$35. Reveller, bay, 15.2, 9 years, sire Satellite, dam Lizzie by Rydsyk's Hambletonian, gr. d. Gold Button by Exton Eclipse.

*Stallions Four Years Old.*

Henry M. Little, Macedon, N. Y., first prize, \$60. Tremont, bay, 16.1, bred by A. J. Alexander, Spring Station, Ky., sire Belmont, dam by Alexander's Abdallah.

J. K. Pearson, Cooperstown, N. Y., second prize, \$30. Johnny Monroe, black, 15.3, bred by Mr. Monroe, Seneca county, sire Tom Thumb, dam by Beary's Sampson, gr. d. by Dey's Messenger.

*Stallions Three Years Old.*

Truman Baker, Earlville, N. Y., first prize, \$50. Yankee Lightfoot, dark bay, bred by A. J. Pomeroy, Sidney Centre, N. Y., sire Major Goldsmith, dam by American Star, gr. d. by Kentucky Lightfoot.

Smiths & Powell, Syracuse, N. Y., second prize, \$25. Syracuse, bay, sire Reveller, dam Loretta by Stebbins' Hambletonian, gr. d. Floretta by Champion of Crawford county.

*Stallions Two Years Old.*

George Rathbun, Troy, Pa., first prize, \$40. Eclipse, steel gray, bred by exhibitor, sired by Mason's horse, a son of Wood's Ham-

bletonian, dam by Seely's Black Hawk, gr. d. by Hill's Black Hawk.

J. C. Walters, Leonardsville, N. Y., second prize, \$20. Leonardsville Star, brown, bred by exhibitor, sire Kingsley's Roman Chief (son of Wallkill Chief), dam by Benedict's Pathfinder, gr. d. by Bellinger's Ethan Allen.

*Mares over Five Years Old.*

R. A. Jones, Whitesboro, N. Y., first prize, \$60. Dark bay, 16, 9 years, sire Pathfinder, dam by Black River Messenger.

Lewis Davis, Frankfort, N. Y., second prize, \$30. Bay, 15.3, 10 years, sire Pathfinder, foal at foot by Hambletonian Prince, Jr.

*Fillies Four Years Old.*

G. H. F. Van Horne, Fonda, N. Y., first prize, \$50. Vessey, chestnut, 15.2., foal at foot by J. H. Starin's Commodore.

B. W. Borden, Frankfort, N. Y., second prize, \$25. Bay, 15.3. sire son of Leach's Starlight.

*Fillies Three Years Old.*

Smiths & Powell, Syracuse, N. Y., first prize, \$40. Zephyr, bay, sire Reveller, dam Jessie by old Rough and Ready, gr. d. Tiptoe by Grinnell's Champion.

Henry M. Little, Macedon, N. Y., second prize, \$20. Belle of Ashland, dark bay, bred by Tracey & Simmons, Ashland Park, Ky., sire Post's Hambletonian by Rysdyk's Hambletonian, dam by American Clay, gr. d. by Downing's Bay Messenger.

*Fillies Two Years Old.*

A. Chandler, Rome, N. Y., first prize, \$30. Lady Kingsley, brown, sire Roman Chief, dam Fanny by Fox Morgan, gr. d. Flora Martin by Powell's Bay Messenger.

Smiths & Powell, Syracuse, N. Y., second prize, \$15. May Flower, chestnut, sire Lysander, dam Lady Stark by Consternation, gr. d. by a thoroughbred horse from South Carolina.

*Fillies One Year Old.*

Smiths & Powell, Syracuse, N. Y., first prize, \$20. Finesse, bay, sire Reveller, dam Betty by Tiptoe, gr. d. said to be thoroughbred.

Edward G. Wagner, Whitesboro', N. Y., second prize, \$10. Dark bay, sire B. G. Babbitt's Highland Chief, he by imported Norman stallion Monarch.

OLIVER FLEMING, Unadilla, N. Y.

RENSSELAER WESTON, New Brunswick, N. J.

*Harness and Saddle Horses.—Draught Pairs.*

W. Ledyard, Cazenovia, N. Y., first prize, \$50. Blacks, 15. 2, 7 and 8 years, bred in Canada, partly of Percheron stock.

*Coach Pairs.*

Mrs. Milton H. Thompson, Utica, N. Y., first prize, \$50. Bay geldings, Nip and Tuck, 16, 8 years.  
 John A. Rumsey, Seneca Falls, N. Y., second prize, \$25. Bay, 16.3, 5 years.

*Phaeton Pairs.*

George Young, Utica, N. Y., first prize, \$50. Gray, 7 years.  
 Daniel Jennison, Lock Berlin, N. Y., second prize, \$25. Brown geldings, 5 years, sire Patchin, Jr.

*Coupe Horses.*

Mark Marriatt, Rome, N. Y., first prize, \$30. Dark bay, 16, 7 years, bred by Jacob Sharp, Rome, N. Y., sire Ned Forrest.  
 Thomas H. Cackett, New Hartford, N. Y., second prize, \$15. Eureka, brown gelding, 16.1, 5 years, by Walkill Chief.

*Roadsters.*

G. A. Hosington, Adams, N. Y., first prize, \$30. Brown gelding, 5 years, sire General Burton.  
 J. D. Ferguson, Utica, N. Y., second prize, \$15. Bay Billy, bay, 16, 6 years, bred by Roselle Austin, sire Pathfinder.

*Saddle Horses.*

Joseph Juliand, Bainbridge, N. Y., first prize, \$30. Flora, spotted, white mane and tail, 15, 7 years, sire Don Quixote.  
 H. C. Gregory, Unadilla, N. Y., second prize, \$15. Bay mare, 15.1, 8 years.

*Jacks and Mules.—Jacks.*

J. K. Pearson, Cooperstown, N. Y., second prize, \$15. Spanish Jack, black, 15, 6 years.

CHARLES D. MILLER, Geneva, N. Y.  
 RENSSELAER WESTON, New Brunswick, N. J.

## SHEEP, SWINE AND POULTRY.

*Long Woolled Sheep—Leicester Rams Two Years Old or over.*

W. L. & W. Rutherford, Waddington, N. Y., second prize, \$10. Two years, bred by exhibitor.

*Leicester Rams One Year Old.*

W. L. & W. Rutherford, Waddington, N. Y., second prize, \$10.

*Pens of (Three) Leicester Ewes over Two Years Old.*

W. L. & W. Rutherford, Waddington, N. Y., first prize, \$20. Three years, bred by exhibitors.

*Pens of (Three) Leicester Yearling Ewes.*

W. L. & W. Rutherford, Waddington, N. Y., first prize, \$20.  
Bred by exhibitors.

*Cotswold Rams over Two Years Old.*

William Potter, Johnstown, N. Y., first prize, \$20.  
George Ingersoll, Charleston, N. Y., second prize, \$10.

*Cotswold Rams One Year Old.*

George Ingersoll, Charleston, N. Y., first prize, \$20.  
George Ingersoll, Charleston, N. Y., second prize, \$10.

*Pens of (Three) Cotswold Ewes over Two Years Old.*

George Ingersoll, Charleston, N. Y., first prize, \$20.  
George Ingersoll, Charleston, N. Y., second prize, \$10.

*Pens of (Three) Cotswold Yearling Ewes.*

George Ingersoll, Charleston, N. Y., first prize, \$20.  
George Ingersoll, Charleston, N. Y., second prize, \$10.

*Lincoln Rams over Two Years Old.*

Samuel Campbell, New York Mills, N. Y., first prize, \$20. Two years.

*Lincoln Rams One Year Old.*

Johnson & Smith, Geneva, N. Y., first prize, \$20.

*Pens of (Three) Lincoln Ewes over Two Years Old.*

Johnson & Smith, Geneva, N. Y., first prize, \$20.  
Samuel Campbell, New York Mills, N. Y., second prize, \$10.

*Pens of (Three) Lincoln Yearling Ewes.*

Johnson & Smith, Geneva, N. Y., first prize, \$20.  
Samuel Campbell, New York Mills, N. Y., second prize, \$10.

JURIAN WINNE, Albany, N. Y.

HENRY BOSHAART, Johnstown, N. Y.

*Middle Woolled Sheep — Southdown Rams over Two Years Old.*

John D. Wing, Millbrook, N. Y., first prize, \$20. Bred by Lord Walsingham.

John D. Wing, Millbrook, N. Y., second prize, \$10. Bred by exhibitor.

*Southdown Rams One Year Old.*

Daniel B. Haight, Dover Plains, N. Y., first prize, \$20. Bred by Lord Walsingham.

John D. Wing, Millbrook, N. Y., second prize, \$10. Bred by exhibitor.

*Pens of (Three) Southdown Ewes over Two Years Old.*

John D. Wing, Millbrook, N. Y., first prize, \$20. Bred by exhibitor.

John D. Wing, Millbrook, N. Y., second prize, \$10. Bred by exhibitor.

*Pens of (Three) Southdown Yearling Ewes.*

Daniel B. Haight, Dover Plains, N. Y., first prize, \$20. Bred by exhibitor.

John D. Wing, Millbrook, N. Y., second prize, \$10. Bred by exhibitor.

*Shropshire Rams over Two Years Old.*

Mrs. L. C. Fish, Otego, N. Y., first prize, \$20.

Berosus Cook, Otego, N. Y., second prize, \$10.

*Shropshire Rams One Year Old.*

Berosus Cook, Otego, N. Y., first prize, \$20.

Mrs. L. C. Fish, Otego, N. Y., second prize, \$10.

*Pens of (Three) Shropshire Ewes over Two Years Old.*

Mrs. L. C. Fish, Otego, N. Y., first prize, \$20.

E. B. Hawks, Wells' Bridge, N. Y., second prize, \$10.

*Pens of (Three) Shropshire Yearling Ewes.*

Berosus Cook, Otego, N. Y., first prize, \$20.

Mrs. L. C. Fish, Otego, N. Y., second prize, \$10.

*Hampshire Rams over Two Years Old.*

Eugene Ham, Verbank, N. Y., first prize, \$20. Four years, bred by L. Kline, Egremont, Mass.

Henry Metcalf, Canandaigua, N. Y., second prize, \$10.

*Hampshire Rams one Year Old.*

Henry Metcalf, Canandaigua, N. Y., first prize, \$20.

*Pens of (Three) Hampshire Ewes over Two Years Old.*

Henry Metcalf, Canandaigua, N. Y., first prize, \$20. Bred by exhibitor.

Eugene Ham, Verbank, N. Y., second prize, \$10.

*Pens of (Three) Hampshire Yearling Ewes.*

Henry Metcalf, Canandaigua, N. Y., first prize, \$20.

THOMAS GALBRAITH, Westport, Conn.  
GEO. VANDERVEER, Amsterdam, N. Y.

*Fine Woolled Sheep—Merinos Bred for Fineness of Wool—Rams over Two Years Old.*

Carl Heyne, Red Hook, N. Y., first prize, \$20.  
Carl Heyne, Red Hook, N. Y., second prize, \$10.

*Rams One Year Old.*

Carl Heyne, Red Hook, N. Y., first prize, \$20.  
Carl Heyne, Red Hook, N. Y., second prize, \$10.

*Pens of (Three) Ewes over Three Years Old.*

Carl Heyne, Red Hook, N. Y., first prize, \$20.  
Carl Heyne, Red Hook, N. Y., second prize, \$10.

*Pens of (Three) Ewes Two Years Old or under.*

Carl Heyne, Red Hook, N. Y., first prize, \$20.  
J. W. Hardy, Palmyra, N. Y., second prize, \$10.

*Merinos Bred for Weight of Fleece—Rams over Two Years Old.*

S. B. Lusk, Batavia, N. Y., first prize, \$20.

*Rams One Year Old.*

S. B. Lusk, Batavia, N. Y., first prize, \$20. Bred by exhibitor.  
J. W. Hardy, Palmyra, N. Y., second prize, \$10.

*Pens of (Three) Ewes Two Years Old or under.*

S. B. Lusk, Batavia, N. Y., first prize, \$20. Bred by exhibitor.  
J. W. Hardy, Palmyra, N. Y., second prize, \$10.

*Merinos Bred for Length of Staple—Rams One Year Old.*

J. W. Hardy, Palmyra, N. Y., first prize, \$20.  
S. B. Lusk, Batavia, N. Y., second prize, \$10. Bred by exhibitor.

*Pens of (Three) Ewes over Three Years Old.*

S. B. Lusk, Batavia, N. Y., first prize, \$20. Bred by exhibitor.

*Pens of (Three) Ewes Two Years Old or under.*

J. W. Hardy, Palmyra, N. Y., first prize, \$20.  
S. B. Lusk, Batavia, N. Y., second prize, \$10. Two years, bred by exhibitor.

DAVIS COSSIT, Onondaga, N. Y.

ROWLAND J. GARDNER, Penn Yan, N. Y.

SWINE.

*Large White Breed—Boars over One Year Old.*

Frank D. Curtis, Charlton, N. Y., first prize, \$20. Victoria.  
Charles Spice, Utica, N. Y., second prize, \$10.

*Boars under One Year Old.*

Charles Spice, Utica, N. Y., first prize, \$20.  
 E. W. Davis, Oneida Castle, N. Y., second prize, \$10.

*Sows over One Year Old.*

Charles Spice, Utica, N. Y., first prize, \$20.  
 E. W. Davis, Oneida Castle, N. Y., second prize, \$10. Eve 2, years  
 six months.

*Sows under One Year Old.*

E. W. Davis, Oneida Castle, N. Y., first prize, \$20.  
 Charles Spice, Utica, N. Y., second prize, \$10.

*Poland China Boars over One Year Old.*

G. H. Bell, Rome, N. Y., first prize, \$20. Tramp, one year and  
 five months, bred by B. F. Tracy, Owego, N. Y.  
 L. C. Gardner, Fayetteville, N. Y., second prize, \$10. Bred by  
 exhibitor.

*Boars under One Year Old.*

G. H. Bell, Rome, N. Y., first prize, \$20. Marshland Boy, bred  
 by B. F. Tracy, Owego.  
 B. F. Tracy, Owego, N. Y., second prize, \$10. Bred by exhibitor.

*Sows over One Year Old.*

G. H. Bell, Rome, N. Y., first prize, \$20. Violet, bred by B. F.  
 Tracy, Owego, N. Y.  
 B. F. Tracy, Owego, N. Y., second prize, \$10. Grace, bred by D.  
 M. Magie & Co.

*Sows under One Year Old.*

B. F. Tracy, Owego, N. Y., first prize, \$20. Bred by exhibitor.  
 B. F. Tracy, Owego, N. Y., second prize, \$10. Bred by exhibitor.

*Duroc or Red — Boars over One Year Old.*

H. & C. H. Holmes, Greenwich, N. Y., first prize, \$20. Major,  
 sire Capt. Jack, dam 20.  
 Oscar J. Lewis, Schodack Centre, second prize, \$10.

*Boars under One Year Old.*

H. & C. H. Holmes, Greenwich, N. Y., first prize, \$20. Red  
 Jacket, sire Major 13, dam Queen.

*Sows over One Year Old.*

H. & C. H. Holmes, Greenwich, N. Y., first prize, \$20. Ruby,  
 sire 13, dam 30.  
 Frank D. Curtis, Charlton, N. Y., second prize, \$10.



*Sows under One Year Old.*

H. & C. H. Holmes, Greenwich, N. Y., first prize, \$20. Garnet, sire Logan 15, dam Marshall.

H. & C. H. Holmes, Greenwich, N. Y., second prize, \$10. Ninette, sire Logan 15, dam Nina.

GEORGE BUTTS, Manlius, N. Y.

H. C. GREGORY, Unadilla, N. Y.

*Small White Breed-Boars over One Year Old.*

H. H. Ingersoll, Owego, N. Y., first prize, \$20. Crown Prince, bred by exhibitor.

T. R. Proctor, Utica, N. Y., second prize, \$10. King George (Yorkshire), bred by Arthur L. Dale, Westernville, N. Y., sire imported Duke of Yorkshire.

*Boars under One Year Old.*

T. R. Proctor, Utica, N. Y., first prize, \$20. Rinaldo (Yorkshire), bred by R. M. Hoc, N. Y., sire Romeo.

J. S. Woodward, Lockport, N. Y., second prize, \$10. (White Suffolk.)

*Sows over One Year Old.*

H. H. Ingersoll, Owego, N. Y., first prize, \$20. Ada Bell, bred by exhibitor.

T. R. Proctor, Utica, N. Y., second prize, \$15. (Yorkshire Lass), (Yorkshire), bred by Arthur L. Dale, Westernville, N. Y., sire Imported Forest Boy.

*Sows under One Year Old.*

J. S. Woodward, Lockport, N. Y., first prize, \$20. (White Suffolk.)

H. H. Ingersoll, Owego, N. Y., second prize, \$10. Queen 2nd, bred by exhibitor.

*Berkshires—Boars over One Year Old.*

Alexander N. Fulford, Bel Air, Md., first prize, \$20. Bred by W. C. Norton.

H. Bowen, Medina, N. Y., second prize, \$10. Sambo IX, Jr., bred by Wm. Smith, Michigan, sire Sambo IX, imported, dam Susie, gr. d. Maid of Oxford.

*Boars under One Year Old.*

Alexander M. Fulford, Bel Air, Md., first prize, \$20.

Alexander M. Fulford, Bel Air, Md., second prize, \$10.

Amos N. Potter, Ridge Mills, N. Y. Benjamin, bred by B. N. Newhouse, Utica, highly commended.

*Sows over One Year Old.*

Alexander M. Fulford, Bel Air, Md., first prize, \$20.  
 T. R. Proctor, Utica, N. Y., second prize, \$10. Gipsy Queen 3rd,  
 bred by exhibitor, sire Gloucester.

*Sows under One Year Old.*

Alexander M. Fulford, Bel Air, Md., first prize, \$20.  
 T. R. Proctor, Utica, N. Y., second prize, \$10. Gipsy Queen 4th,  
 bred by exhibitor, sire Gloucester.

*Essex — Boars over One Year Old.*

Joseph Harris, Rochester, N. Y., first prize, \$20.  
 J. S. Woodward, Lockport, N. Y., second prize, \$10.

*Boars under One Year Old.*

Joseph Harris, Rochester, N. Y., first prize, \$20.  
 J. S. Woodward, Lockport, N. Y., second prize, \$10.

*Sows over One Year Old.*

J. S. Woodward, Lockport, N. Y., first prize, \$20.  
 Joseph Harris, Rochester, N. Y., second prize, \$10.

*Sows under One Year Old.*

J. S. Woodward, Lockport, N. Y., first prize, \$20.  
 J. S. Woodward, Lockport, N. Y., second prize, \$10.  
 J. ASHWORTH, Ottawa, Ca.  
 M. C. WELD, Closter, N. J.

*Poultry — Collections of Pure-Bred Poultry.*

O. Howland, Auburn, N. Y., large silver medal.

*Pairs of Light Brahmas.*

H. B. Thomas, Troy, N. Y., first prize, \$5.  
 T. R. Proctor, Utica, N. Y., second prize, \$3.

*Pairs of Dark Brahmas.*

J. M. Seymour, Clark's Mills, N. Y., first prize, \$5.

*Pairs of Buff, Lemon, or Cinnamon Cochins.*

L. J. Bundy, Furnaceville, N. Y., first prize, \$5.  
 J. M. Seymour, Clark's Mills, N. Y., second prize, \$3.

*Pairs of Partridge, or Grouse Cochins.*

J. M. Seymour, Clark's Mills, N. Y., first prize, \$5.  
 O. Howland, Auburn, N. Y., second prize, \$3.

*Pairs of White Cochins.*

J. M. Seymour, Clark's Mills, N. Y., second prize, \$3.

*Pairs of Colored Dorkings.*

- G. H. Warner, New York Mills, N. Y., first prize, \$5.  
 J. M. Seymour, Clark's Mills, N. Y., second prize, \$3.

*Pairs of White Dorkings.*

- G. H. Warner, New York Mills, N. Y., first prize, \$5.

*Pairs of Silver Gray Dorkings.*

- G. H. Warner, New York Mills, N. Y., first prize, \$5.  
 J. M. Seymour, Clark's Mills, N. Y., second prize, \$3.

*Pairs of Dominiques.*

- S. P. Halleck, Oriskany, N. Y., first prize, \$5.  
 S. P. Halleck, Oriskany, N. Y., second prize, \$3 (chicks).

*Pairs of Golden Spangled Hamburgs.*

- Newton Adams, Utica, N. Y., first prize, \$5.  
 Newton Adams, Utica, N. Y., second prize, \$3.

*Pairs of Silver Spangled Hamburgs.*

- Newton Adams, Utica, N. Y., first prize, \$5.  
 Edwin E. Kelty, Albany, N. Y., second prize, \$3.

*Pairs of Golden Penciled Hamburgs.*

- W. H. Underwood, East Scott, N. Y., first prize, \$5.

*Pairs of Silver Penciled Hamburgs.*

- Newton Adams, Utica, N. Y., first prize, \$5.  
 D. A. Carter, Utica, N. Y., second prize, \$3.

*Pairs of Black Hamburgs.*

- W. H. Underwood, East Scott, N. Y., first prize, \$5.  
 Newton Adams, Utica, N. Y., second prize, \$3.

*Pairs of White Hamburgs.*

- Edwin E. Kelty, Albany, N. Y., first prize, \$5.

*Pairs of Black Spanish.*

- O. Howland, Auburn, N. Y., first prize, \$5.  
 W. H. Underwood, East Scott, N. Y., second prize, \$3.

*Pairs of White Leghorns.*

- O. Howland, Auburn, N. Y., first prize, \$5.  
 W. H. Underwood, East Scott, N. Y., second prize, \$3.

*Pairs of Brown Leghorns.*

- H. B. Thomas, Troy, N. Y., first prize, \$5.  
 John D. Ernst, Franklin Iron Works, N. Y., second prize, \$3.

*Pairs of Black Leghorns.*

J. M. & H. Semple, Utica, N. Y., first prize, \$5.

J. N. & H. Semple, Utica, N. Y., second prize, \$3 (chicks).

*Pairs of Dominique Leghorns.*

W. H. Underwood, East Scott, N. Y., first prize, \$5.

*Pairs of Plymouth Rocks.*

L. J. Bundy, Furnaceville, N. Y., first prize, \$5.

L. J. Bundy, Furnaceville, N. Y., second prize, \$3.

*Pairs of Creve-Coeurs.*

J. M. Seymour, Clark's Mills, N. Y., first prize, \$5.

J. M. Seymour, Clark's Mills, N. Y., second prize, \$3.

*Pairs of Houdans.*

Michael Ryan, Utica, N. Y., first prize, \$5.

Michael Ryan, Utica, N. Y., second prize, \$3.

*Pairs of La Fleche.*

J. M. Seymour, Clark's Mills, N. Y., first prize, \$5.

O. Howland, Auburn, N. Y., second prize, \$3.

*Pairs of Black Polish.*

W. H. Underwood, East Scott, N. Y., first prize, \$5.

W. H. Underwood, East Scott, N. Y., second prize, \$3.

*Pairs of White Polish (white crests).*

W. H. Underwood, East Scott, N. Y., first prize, \$5.

W. H. Underwood, East Scott, N. Y., second prize, \$3.

*Pairs of Golden Polish.*

O. Howland, Auburn, N. Y., second prize, \$3.

*Pairs of Silver Polish.*

O. Howland, Auburn, N. Y., first prize, \$5.

W. H. Underwood, East Scott, N. Y., second prize, \$3.

*Pairs of Black-Breasted Red Games.*

J. M. Seymour, Clark's Mills, N. Y., first prize, \$5.

John Hope, Millbrook, N. Y., second prize, \$3.

*Pairs of Brown-Breasted Red Games.*

John Hope, Millbrook, N. Y., first prize, \$5.

John Hope, Millbrook, N. Y., second prize, \$3.

*Pairs of Silver Duck-wing Games.*

H. W. Skerritt, Deansville, N. Y., second prize, \$3.

*Pairs of Yellow Duck-wing Games.*

A. B. Smith, Whitesboro, N. Y., first prize, \$5.

J. M. Seymour, Clark's Mills, N. Y., second prize, \$3.

*Pairs of Red Pile Games.*

O. Howland, Auburn, N. Y., first prize, \$5.

John Hope, Millbrook, N. Y., second prize, \$3.

*Pairs of White Pile Games.*

W. H. Underwood, East Scott, N. Y., first prize, \$5.

J. M. Seymour, Clark's Mills, N. Y., second prize, \$3.

*Pairs of Black Red Game Bantams.*

W. V. Keith, Deansville, N. Y., first prize, \$5.

O. Howland, Auburn, N. Y., second prize, \$3.

*Pairs of Red Pile Game Bantams.*

O. Howland, Auburn, N. Y., first prize, \$5.

D. A. Carter, Utica, N. Y., second prize, \$3.

*Pairs of Silver Duck-wing Game Bantams.*

H. W. Skerritt, Deansville, N. Y., first prize, \$5.

H. W. Skerritt, Deansville, N. Y., second prize, \$3.

*Pairs of Yellow Duck-wing Game Bantams.*

O. Howland, Auburn, N. Y., first prize, \$5.

J. M. Seymour, Clark's Mills, N. Y., second prize, \$3.

*Pairs of Gold-laced Sebright Bantams.*

G. H. Warren, New York Mills, N. Y., first prize, \$5.

J. M. Seymour, Clark's Mills, N. Y., second prize, \$3.

*Pairs of Black Bantams.*

J. M. Seymour, Clark's Mills, N. Y., second prize, \$3.

*Pairs of other Bantams.*

O. Howland, Auburn, N. Y., second prize, \$3 (white booted).

*Pairs of Bronze Turkeys.*

Joseph Juliand, Bainbridge, N. Y., first prize, \$5.

*Pairs of White Turkeys.*

Frank D. Carter, Charlton, N. Y., first prize, \$5.

D. A. Carter, Utica, N. Y., second prize, \$3.

*Pairs of Gray or Narragansett Turkeys.*

J. M. Seymour, Clark's Mills, N. Y., first prize, \$5.

*Pairs of Pearl Guinea Fowls.*

Orsino Beebe, Hamilton, N. Y., first prize, \$5.

R. A. Jones, Whitesboro, N. Y., second prize, \$3.

*Pairs of White Guinea Fowls.*

Joseph Juliand, Bainbridge, N. Y., first prize, \$5.

W. H. Underwood, East Scott, N. Y., second prize, \$3.

*Pairs of Pea Fowls.*

Joseph Juliand, Bainbridge, N. Y., first prize, \$5.

T. W. Spofard, Clinton, N. Y., second prize, \$3.

*Pairs of Bremen Geese.*

O. Howland, Auburn, N. Y., first prize, \$5.

N. Barns, New Hartford, N. Y., second prize, \$3.

*Pairs of White China Geese.*

O. Howland, Auburn, N. Y., first prize, \$5.

*Pairs of Brown China Geese.*

O. Howland, Auburn, N. Y., first prize, \$5.

Joseph Juliand, Bainbridge, second prize, \$3.

*Pairs of Wild Geese.*

O. Howland, Auburn, N. Y., second prize, \$3.

*Pairs of Rouen Ducks.*

W. H. Underwood, East Scott, N. Y., first prize, \$5.

J. M. Seymour, Clark's Mills, second prize, \$3.

*Pairs of Aylesbury Ducks.*

O. Howland, Auburn, N. Y., first prize, \$5.

W. H. Underwood, East Scott, N. Y., second prize, \$3.

*Pairs of Cayuga Ducks.*

J. M. Seymour, Clark's Mills, N. Y., first prize, \$5.

O. Howland, Auburn, N. Y., second prize, \$3.

*Pairs of Muscovy Ducks.*

R. A. Jones, Whitesboro, N. Y., first prize, \$5.

F. S. Blessing, Slingerlands, N. Y., second prize, \$3.

*Pairs of Pekin Ducks.*

O. Howland, Auburn, N. Y., first prize, \$5.

N. Barns, New Hartford, N. Y., second prize, \$3.

*Pigeons — Pairs of Pouters.*

Mathias Cook, Utica, N. Y., first prize, \$3.

Fred. S. Blessing, Slingerlands, N. Y., second prize, \$2.

*Pairs Short-faced Tumblers.*

Mathias Cook, Utica, first prize, \$3.

*Pairs of Barbs.*

Mathias Cook, N. Y., first prize, \$3.

*Pairs of Turbits (winged.)*

Mathias Cook, Utica, N. Y., second prize, \$2.

*Pairs of Owls (solid color).*

Mathias Cook, Utica, N. Y., first prize, \$3.

*Pairs of Shaking Fan-Tails.*

Mathias Cook, Utica, N. Y., first prize, \$3.

N. Barns, New Hartford, N. Y., second prize, \$2.

*Pairs of Jacobins.*

N. Barns, New Hartford, N. Y., first prize, \$3.

*Pairs of Blue Rocks.*

Mathias Cook, Utica, N. Y., first prize, \$3.

*Pairs of Dragoons.*

Mathias Cook, Utica, N. Y., first prize, \$3.

*Pairs of Antwerps.*

Mathias Cook, Utica, N. Y., first prize, \$3.

*Collections of Pouters.*

Mathias Cook, Utica, N. Y., first prize, \$5.

*Collections of Tumblers.*

Mathias Cook, Utica, N. Y., first prize, \$5.

*Collections of Fancy Pigeons.*

Mathias Cook, Utica, N. Y., first prize, \$5.

*Collections of Toy Pigeons.*

Mathias Cook, Utica, N. Y., first prize, \$5.

*Lop-eared or Madagascar Rabbits — Self-colored Bucks.*

George H. Warner, New York Mills, N. Y., first prize, \$3.

*Broken-colored Does.*

George H. Warner, New York Mills, N. Y., second prize, \$2.

*Common Rabbits — Bucks.*

F. S. Blessing, Slingerlands, N. Y., second prize, \$1.

*Does.*

Joseph Juliand, Bainbridge, N. Y., first prize, \$2.

*Extra Entries.*

Stephen Green, Utica, N. Y., \$2. Himalayan Rabbits.

Stephen Green, Utica, N. Y., \$1. Angora Rabbits.

C. H. MALLESON, Hudson, N. Y.

G. W. CHIDSEY, Elmira, N. Y.

A. M. HALSTED, Rye, N. Y.

## HATCHING APPARATUS.

*Incubators (in operation).*

A. M. Halsted, Rye, N. Y., first prize, \$10.

*Artificial Mothers.*

A. M. Halsted, Rye, N. Y., first prize, \$10. Centennial brooder, No. 1 size, \$15.

A. M. Halsted, Rye, N. Y., second prize, \$5. Centennial brooder (new style, all metal).

G. W. CHIDSEY, Elmira, N. Y.

C. H. MALLESON, Hudson, N. Y.

## IMPLEMENTS AND MACHINERY.

*Portable Steam Engines.*

Philo S. Curtis, Utica, N. Y., bronze medal. Portable steam engine and boiler, ten-horse power.

Philo S. Curtis, Utica, N. Y., bronze medal. Portable dairy engine and boiler, five-horse power.

Empire Steam Pump Co., Carthage, N. Y., certificate of merit. Sectional steam boiler, 800 lbs., \$115.

Empire Steam Pump Co., Carthage, N. Y., certificate of high merit. Steam pumping engine, 75 lbs., \$40.

G. Westinghouse & Co., Schenectady, N. Y., bronze medal. Ten-horse power, 3800 lbs., \$900.

*Potato Diggers.*

William Boyd, Hartford, N. Y., certificate of merit. 950 lbs., \$125.

George W. Kintz, West Henrietta, N. Y., certificate of merit. 175 lbs., \$25.

J. S. Hotaling, Albany, N. Y., certificate of high merit.

*Ploughs and Attachments to Ploughs.*

Gale Manufacturing Co., Albion, Mich., certificate of high merit.

Exhibition of chilled ploughs.



Syracuse Chilled Plough Co., Syracuse, N. Y., certificate of high merit. Exhibition of chilled iron ploughs.

*Potato Beetle Destroyers.*

- John C. Campbell, Syracuse, N. Y., certificate of merit. Potato bug destroyer, worked by horse power.  
 Potter & Dewey, Boonville, N. Y., certificate of merit. Potter's potato bug destroyer, 98 lbs., \$15.  
 Goodrich E. Kitley, Waterville, N. Y., certificate of merit. Machine for gathering potato bugs, 80 lbs., \$50.

MISCELLANEOUS.

- H. Brewer & Co., Tecumseh, Mich., certificate of high merit. Machine for manufacturing drain tile and brick, 4,000 lbs., tile machine, \$540; attachments for brick \$85.  
 Chadbourne & Coldwell Manufacturing Co., Newburgh, N. Y., certificate of merit. Lawn mowers.  
 The Earle Clothes Dryer Manufacturing Co., Utica, N. Y., certificate of high merit. Dryer and lawn tent combined.  
 J. M. Gray, Hamilton, N. Y., certificate of merit. Snow ploughs.  
 John Hafer, Bedford, Pa., certificate of high merit. Hafer's self-bracing portable fence.  
 Pierce Well Excavator Co., New York city, certificate of high merit. Well excavator or earth auger, 1,200 lbs., \$150.  
 Pierce Well Excavator Co., New York city, certificate of high merit. Artesian well drilling and mineral prospecting machine, 3,000 lbs., \$654.  
 J. C. Read, New Hartford, N. Y., certificate of high merit. Improved farm gate, 64 lbs., \$5.  
 A. J. Whitcomb & Jas. H. Fitch, Ilion, N. Y., certificate of high merit. Lawn mower called the "Ladies' Friend," hand power 14inch machine, 23 lbs., \$14.  
 Utica Novelty Works, Utica, N. Y., certificate of high merit. Combined pipe-wrench and ratchet drill.

*Hay and Cattle Scales.*

- Jones of Binghamton, Binghamton, N. Y., bronze medal. 5-ton hay scale.

*Fanning Mills.*

- S. B. Van Duzer & Co., Gouverneur, N. Y., bronze medal. Bonanza fanning-mill for cleaning grain from the chaff, 190 lbs., \$40.

*Machines for Cleaning and Assorting Grain, etc.*

- S. B. Van Duzer & Co., Gouverneur, N. Y., bronze medal. Bonanza machine for cleaning and assorting grain and seeds, 190 lbs. \$40.

*Corn husking Machines.*

J. Van Zandt, Schenectady, N. Y., bronze medal. Jones' patent corn-husker, steam or horse-power, 800 lbs., \$125.

*Flax-Seed Cleaners.*

S. B. Van Duzer & Co., Gouverneur, N. Y., bronze medal. Bonauza machine for cleaning flax-seed, 190 lbs., \$40.

*Buckwheat Scourers.*

Munson Brothers, Utica, N. Y., certificate of high merit. Buckwheat huller.

*Feed or Chaff Cutters for Power.*

Keystone Manufacturing Co., Sterling, Ill., certificate of high merit. Hand and power feed cutter, 275 lbs., \$35.

E. W. Ross & Co., Fulton, N. Y., bronze medal. Feed cutter for power, \$70.

*Hand Feed Cutters.*

E. W. Ross & Co., Fulton, N. Y., bronze medal. Feed cutter for hand, \$30.

*Corn Shellers — Power.*

Keystone Manufacturing Co., Sterling, Ill., bronze medal. Two-horse power, 200 lbs., \$22.

*Corn Shellers — Hand.*

Keystone Manufacturing Co., Sterling, Ill., bronze medal. 100 lbs., \$12.50.

*Farm Grain Mills.*

Ames Plow Co., Boston, Mass., bronze medal. Improved horse or hand grain-mill, \$20.

Ames Plow Co., Boston, Mass., bronze medal. No. 5 improved hand corn-mill, \$7.50.

Munson Brothers, Utica, N. Y., bronze medal. No. 24 mill for feed and corn, with and without bolting attachment for making buckwheat flour.

*Apple Grinders or Graters — Power.*

Boomer & Boschert Press Co., Syracuse, N. Y., bronze medal. Apple-grater, 290 lbs.

*Cider Mills.*

Ames Plow Co., Boston, Mass., bronze medal. National family cider and wine-mill, \$15; ditto Farmer's ditto, \$30.

Keystone Manufacturing Co., Sterling, Ill., bronze medal. Large (hand) cider-mill, 400 lbs., \$33.

*Hand and Power Presses.*

Boomer & Boschert Press Co., Syracuse, N. Y., bronze medal. Power cider-press, 2,500 lbs.

P. K. Dederick & Co., Albany, N. Y., bronze medal. Lever Perpetual hay-press, \$350.

*Root Cutters.*

Ames Plow Co., Boston, Mass., bronze medal. Vegetable cutter, N. M. & Co., \$15.

*Pumps for Farm Use.*

A. W. Miner & Co., Belmont, N. Y., bronze medal. Howe's triple action force pumps, 100 lbs., \$15.

Joseph Nunn, Carthage, N. Y., bronze medal. Rubber bucket chain pump.

Rumsey & Co., Seneca Falls, N. Y., bronze medal. Pumps, hydraulic rams, garden and green-house engines, etc.

*Washing Machines.*

David J. H. Davies, Ogdensburg, N. Y., certificate of high merit. The Howell steam washer and bleacher, 18 lbs., \$8 and \$16.

D. W. Fox, North Harpersfield, N. Y., certificate of high merit. Common sense clothes washer, 10 lbs., \$6.50.

**MISCELLANEOUS.**

D. D. Brewster & Son, Unadilla, N. Y., bronze medal. Buckwheat retiner, 900 lbs., \$300.

L. Dean, Utica, N. Y., certificate of high merit. Exhibition of wrought-iron fence, settees, vases etc.

Washburn & Moen Manufacturing Co., Worcester, Mass., certificate of high merit. Machinery for making barbed fence wire.

*Wood-working Machinery—Hand Scroll-sawing Machines.*

Millers Falls Co., New York city, bronze medal. Lester scroll-saw and lathe, 50 lbs., \$8.

Millers Falls Co., New York city, bronze medal. Rogers' scroll-saw, 30 lbs., \$3.

*Dairy Implements—Churns for Large Dairies.*

Ezra Buell, Heuvelton, N. Y., bronze medal. \$25.

*Churns for Small Dairies.*

Ames Plow Co., Boston, Mass., bronze medal. No. 4 Davis' self-adjusting churn and butterworker, \$6; No. 6, \$9.

Vermont Farm Machine Co., Bellows Falls, Vt., certificate of merit. Davis' oscillating churn.

*Butter Workers.*

Vermont Farm Machine Co., Bellows Falls, Vt., certificate of merit. Eureka butter worker.

*Milk Pans — Metal.*

Bunnell & Brown, Guilford, N. Y., bronze medal. Iron-clad milk pans.

*Butter Tubs.*

Richard R. Jones, Remsen, N. Y., bronze medal. 50 lbs. size, 12 lbs., 60 cts., 35 lbs. size, 10 lbs., 50 cts.

*Packages for Transporting Butter in Hot Weather.*

Dairy Supply Co., New York, N. Y., bronze medal. Transportation tubs and boxes, with or without ice.

*Coopers' Work.*

Richard R. Jones, Remsen, N. Y., bronze medal.

*Miscellaneous Dairy Appliances.*

Samuel Bligh, Oneonta, N. Y., certificate of merit. Self-motor power churning machine, 1000 lbs., \$50.

Bunnell & Brown, Guilford, N. Y., certificate of merit. Brown's Arctic creamery.

Bunnell & Brown, Guilford, N. Y., certificate of high merit. Butter salting scales.

Dairy Supply Co., New York, N. Y., certificate of high merit. Glass milk jars and bottles, for individual delivery.

A. A. Durand, Auburn, N. Y., certificate of merit. Durand's suction cow milker, \$55.

The Ferguson Manufacturing Co., Burlington, Vt., certificate of high merit. The Ferguson Bureau creamery, 400 lbs., \$50 to \$63.

Horton Brothers, Binghamton, N. Y., certificate of merit. Horton's new creamery, 125 lbs., \$25.

Hull & Arnold, Maine, N. Y., certificate of merit. Dairyman's Friend creamery, 60 lbs., \$20.

Moseley & Stoddard, Poultney, Vt., certificate of high merit. Moseley's Cabinet creamery, No. 2, for raising cream in farm dairy, also in hotels, etc., 145 lbs., \$30.

Dairy Supply Co., New York, N. Y., certificate of merit. Perfect milk pail.

**TOOLS AND HAND IMPLEMENTS.***Exhibitions of Farm and Garden Tools and Implements.*

J. M. Childs & Co., Utica, N. Y., bronze medal.

J. M. Childs & Co., Utica, N. Y., certificate of high merit. Display of plows.

*Exhibitions of Carpenters' and Mechanics' Tools.*

William Dent & Son, Utica, N. Y., bronze medal. Exhibition of machinist's tools, consisting of drills, screw plates, taps and dies, drill chucks, Stephen's patent vises, etc.

Herman Ehle, Utica, N. Y., certificate of merit. Combined sleigh and wheel-barrow.

Miller's Falls Co., New York city, N. Y., certificate of merit. family grind-stone and emery wheel. \$3.50.

Miller's Falls Co., New York city, N. Y., certificate of high merit. Langdon's mitre box. \$10.

J. V. Henry Nott, Glencrie, N. Y., certificate of merit. Bag holder and hand truck, 30 lbs., \$4.00.

B. T. Steber, Utica, N. Y., bronze medal. Steber's patent ratchet drill, telescopic sections having motion upon each other, giving capacity for different situations and variable lengths, with extension handle, No. 1, 3 inches, \$14.50; No. 2, 4 inches, \$17.50; No. 3, 5 inches, \$20. With ordinary handle, \$13, \$15 and \$18.

#### WAGONS, CARRIAGES, SADDLERY AND ARTICLES OF WHEELWRIGHT'S AND BLACKSMITH'S WORK.

##### *Park Phaetons — Four or Six Seats.*

E. Coleman & Co., Ilion, N. Y., bronze medal. Six seat pleasure wagon, 650 lbs., \$200.

##### *Road Wagons — Four Seats.*

C. Benedict, Little Falls, N. Y., bronze medal. Two seat Windsor T cart, 400 pounds, \$225.

Watertown Spring Wagon Co., Watertown, N. Y., first premium. Platform pleasure wagon, four seats, 400 pounds, \$115.

Watertown Spring Wagon Co., Watertown, N. Y., bronze medal. Platform spring road wagon, with Fitch & Wood patent reach and drawing from the axle, four seats, 450 pounds, \$100.

##### *Open Wagons — Two Seats.*

F. Coleman & Co., Ilion, N. Y., bronze medal. Brewster's patent side-bar wagon, without top, 275 lbs., \$160.

Jacob C. Walter, Leonardsville, N. Y., certificate of merit. Coil spring, for side-bar wagons.

##### *Top Wagons — Two Seats.*

C. Benedict, Little Falls, N. Y., bronze medal. Side-bar top buggy, 225 lbs., \$225.

F. Coleman & Co., Ilion, N. Y., bronze medal. Single phaeton, 3 springs, with top, 300 lbs., \$275.

##### *Business Wagons.*

Watertown Spring Wagon Co., Watertown, N. Y., bronze medal. Platform spring business wagon, 400 lbs., \$90.

##### *Double Farm Wagons.*

Empire State Wagon Works, Lyons, N. Y., bronze medal. Full rigged lumber wagon for farm use, 800 lbs., \$65.

Aristide T. Hermant, Utica, N. Y., certificate of high merit.

*Rollers.*

Stringer, Barr & Co., Munnsville, N. Y., bronze medal. Land roller, 1350 lbs., \$45.

*Extra Entries.*

John C. Campbell, Syracuse, N. Y., certificate of merit. Improved draft bars for sleighs.

O. S. Gorton, North Brookfield, N. Y., certificate of merit. Patent spring wagon gear, 178 lbs., \$32.

John N. Meyer, Hamilton, N. Y., certificate of high merit. Patent hubs for wagon wheels.

F. C. Mitchell & Co., Benton Harbor, Mich., certificate of high merit. Patent helical spring for beds, wagon seats, etc. Bed, 25 lbs., \$6; seat, 30 lbs., \$5.

H. W. Pell, Rome, N. Y., certificate of high merit. Side-bar wagon-spring with body attached, \$22.

H. W. Pell, Rome, N. Y., certificate of high merit. Side-bar wagon-spring with body attached, for four persons, \$30.

C. Phelps, Taberg, N. Y., certificate of merit. Hold-back attachment to harness and shafts.

# MANUFACTURES, HAND WORK (ORNAMENTAL AND USEFUL), INVENTIONS, MODELS, ETC.

*Stoves, etc.*

W. G. Flanders & Co., Lausburgh, N. Y., certificate of merit. Flanders' domestic steam cooker, No. 2, \$5.50; No. 5, \$7.50.

*Entries Unclassified—Manufactures, Artistic, Musical, etc.*

Mrs. A. B. C. Diefendorf, Rome, N. Y., certificate of high merit. Assortment of ladies' hair goods.

J. M. Gray, Hamilton, N. Y., certificate of merit. Weather strips for doors and windows.

J. O. Lamson, Rome, N. Y., certificate of high merit. Exhibition of fancy wood manufactures, easels, brackets, thermometers, Swiss clocks, etc., etc.

John N. Meyer, Hamilton, N. Y., certificate of merit. New invention in horse shoes.

C. Palmer & Son, Utica, N. Y., certificate of high merit. Exhibition of ornamental iron work, settees, chairs, vases, fences, etc., etc.

Price & Knickerbocker, Albany, N. Y., bronze medal. Copper weather vanes.

H. W. Hadley, Lodi, N. Y., certificate of high merit. Farm gates.

Cortland Wagon Co., Cortland, N. Y., certificate of high merit. Side spring piano box open wagon.

B. T. Daniels, Utica, N. Y., certificate of merit. Small rotary churns.

Newton & Tuttle, Kalamazoo, Mich., certificate of high merit.  
Wagon shafts.

W. P. Kelly, Oneida, N. Y., certificate of merit. Set of carriage  
springs, with attachments.

JAMES L. INGALSBE, South Hartford, N. Y.  
A. A. SWEET, Syracuse, N. Y.

## FARM PRODUCE.

### GRAIN, SEEDS, ETC., GROWN IN 1879.

#### *White Winter Wheat.*

Oscar J. Lewis, Schodack Centre, N. Y., first prize, \$10. Clawson.  
William P. Ottley, Phelps, N. Y., second prize, \$5.

#### *Red Winter Wheat.*

A. M. Potter, Ridge Mills, N. Y., first prize, \$10. Lancaster  
E. Van Allen, Bethlehem Centre, N. Y., 2d prize, \$5.

#### *Winter Rye.*

Howard Blessing, Slingerlands, N. Y., first prize, \$10.  
E. Van Allen, Bethlehem Centre, N. Y., second prize, \$5.

#### *White Oats.*

F. S. Blessing, Slingerlands, N. Y., first prize, \$10.  
W. P. Ottley, Phelps, N. Y., second prize, \$5.

#### *Black or Gray Oats.*

E. Van Allen, Bethlehem, Centre, N. Y., second prize, \$5.

#### *Two-rowed Spring Barley.*

Stryker & Jones, Rome, N. Y., first prize, \$10.

#### *Four-rowed Spring Barley.*

W. P. Ottley, Phelps, N. Y., first prize, \$10.

#### *Yellow Indian Corn (shelled).*

E. Van Allen, Bethlehem Centre, N. Y., first prize, \$10.

#### *Field Beans (large).*

F. S. Blessing, Slingerlands, N. Y., first prize, \$10.  
F. S. Blessing, Slingerlands, N. Y., second prize, \$5.

#### *Buckwheat.*

George W. Kinney, Stanwix, N. Y., first prize, \$5.  
J. F. Tillinghast, Factoryville, Penn., second prize, \$3.

*Timothy Seed.*

O. B. Sheaf, East Schuyler, N. Y., first prize, \$5.  
 Deloss Wentworth, Mohawk, N. Y., second prize, \$3.

*Millet.*

F. S. Blessing, Slingerlands, N. Y., first prize, \$5.

*Sorghum Seed.*

J. F. Tillinghast, Factoryville, Penn., second prize, \$3.

*25 Ears of Yellow Corn, Eight rowed.*

Morgan Decker, Owego, N. Y., first prize, \$5.  
 Harvey Wood, West Schuyler, N. Y., second prize, \$3.

*25 Ears of Yellow Corn, Twelve-rowed.*

Morgan Decker, Owego, N. Y., first prize, \$5.  
 W. A. & J. F. Barns, Kirkland, N. Y., second prize, \$3.

*25 Ears of White Corn.*

Harvey Wood, West Schuyler, N. Y., second prize, \$3.

*25 Ears of Early Sweet Corn.*

Stryker & Jones, Rome, N. Y., first prize, \$5.  
 Seth Bonfoy, West Winfield, N. Y., second prize, \$3.

*25 Ears of Late Sweet Corn.*

Stryker & Jones, Rome, N. Y., first prize, \$5.  
 Harvey Wood, West Schuyler, N. Y., second prize, \$3.

M. W. BOSWORTH, Binghamton, N. Y.  
 HENRY BOSHART, Johustown, N. Y.

## VEGETABLES.

*Celery.*

William Treen, Utica, N. Y., first prize, \$3.  
 Stephen Treen, Utica, N. Y., second prize, \$2.

*Cauliflowers.*

Michael Torpy, Utica, N. Y., first prize, \$3.

*Cabbages.*

Lewis Brewer, Schenectady, N. Y., first prize, \$3.  
 Michael Torpy, Utica, N. Y., second prize, \$2.

*Lettuce.*

Michael Torpy, Utica, N. Y., first prize, \$3.  
 Lewis Brewer, Schenectady, N. Y., second prize, \$2.

*Turnips.*

W. A. & J. F. Barns, Kirkland, N. Y., first prize, \$3.  
 Lewis Brewer, Schenectady, N. Y., second prize, \$2.



*Mangolds.*

S. Hoxie, Whitestown, N. Y., first prize, \$3.  
T. R. Proctor, Utica, N. Y., second prize, \$2.

*Beets.*

Charles N. Tuttle, Clockville, N. Y., first prize, \$3.  
Lewis Brewer, Schenectady, N. Y., second prize, \$2.

*Orange Carrots.*

T. R. Proctor, Utica, N. Y., first prize, \$3.  
E. Van Allen, Bethlehem Centre, N. Y., second prize, \$2.

*White Carrots.*

Michael Torpy, Utica, N. Y., first prize, \$3.  
Oscar J. Lewis, Schodack Centre, N. Y., second prize, \$2.

*Parsnips.*

E. Van Allen, Bethlehem Centre, N. Y., first prize, \$3.  
Lewis Brewer, Schenectady, N. Y., second prize, \$2.

*Salsify.*

E. Van Allen, Bethlehem Centre, N. Y., first prize, \$3.  
William Treen, Utica, N. Y., second prize, \$2.

*Kohl-Rabi.*

F. C. Brehm, Waterloo, N. Y., first prize, \$3.  
E. Van Allen, Bethlehem Centre, N. Y., second prize, \$2.

*Onions.*

Michael Torpy, Utica, N. Y., first prize, \$3.  
E. Van Allen, Bethlehem Centre, N. Y., second prize, \$2.

*Tomatoes.*

Michael Torpy, Utica, N. Y., first prize, \$3.  
Charles N. Tuttle, Clockville, N. Y., second prize, \$2.

*Egg-Plants.*

Michael Torpy, Utica, N. Y., first prize, \$3.  
Samuel Slade, Utica, N. Y., second prize, \$2.

*Garden Beans.*

Oscar S. Lewis, Schodack Centre, N. Y., first prize, \$3.  
F. S. Blessing, Slingerlands, N. Y., second prize, \$2.

*Peppers.*

E. Van Allen, Bethlehem Centre, N. Y., first prize, \$3.  
Michael Torpy, Utica, N. Y., second prize, \$2.

*Squashes.*

Michael Torpy, Utica, N. Y., first prize, \$3.

Lewis Brewer, Schenectady, N. Y., second prize, \$2.

*Pumpkins.*

Oscar J. Lewis, Schodack Centre, N. Y., first prize, \$3.

*Potatoes — Collections of Early Varieties.*

Oscar J. Lewis, Schodack Centre, N. Y., first prize, \$10.

Lewis Brewer, Schenectady, N. Y., second prize, \$5.

*Potatoes — Collections of Late Varieties.*

Oscar J. Lewis, Schodack Centre, N. Y., first prize, \$10.

Lewis Brewer, Schenectady, N. Y., second prize, \$5.

*Potatoes — Collections of Stock-Feeding Varieties.*

J. F. Tillinghast, Factoryville, Penn., first prize, \$10.

A. S. Johnson, Chili Station, N. Y., second prize, \$5.

E. S. HAYWARD, Rochester N. Y.

ROBERT WEMPLE, Fultonville, N. Y.

## DAIRY PRODUCE, ETC.

## BUTTER.

*Special Prize for the Best Six Packages, of not less than Thirty Pounds net each, made in the same Creamery or Private Dairy.*

O. & A. F. Risley, New York Mills Cold Spring Creamery, New York Mills, N. Y., prize, \$50.

*Packages of not less than Thirty Pounds net, made at any time in Creamery.*

W. R. Slaughter, Frankfort Hill, N. Y., second prize, \$20.

*Packages of not less than Thirty Pounds net, made in June in Private Dairy.*

William F. Ford, West Davenport, N. Y., first prize, \$30.

Deloss Wentworth, Mohawk, N. Y., second prize, \$20.

Andrew O. Biggar, Pepacton, N. Y., third prize, \$10.

*Packages of not less than Thirty Pounds net, made at any time, in Private Dairy.*

Morgan Decker, Owego, N. Y., first prize, \$30.

Andrew O. Biggar, Pepacton, N. Y., second prize, \$20.

Morgan Wood & Bro., West Martinsburgh, N. Y., third prize, \$10.

*Five Pounds in Prints, Molds or Rolls.*

- L. W. Ledyard, Cazenovia, N. Y., first prize, \$10.  
 T. A. Cole, Solsville, N. Y., second prize, \$5.

## CHEESE.

*Special Prize for the best Dozen Cheeses, of not less than Twenty Pounds each, from the same Factory or Dairy, and Suitable for Army and other uses.*

- L. L. Wight, Whitesboro, N. Y., prize, \$50.

*American Cheeses, Factory or Other, not less than Twenty Pounds in Weight, over One Year Old.*

- Seth Bonfoy, West Winfield, N. Y., first prize, \$30.  
 S. B. Douglass, Reed's Corners, N. Y., second prize, \$20.  
 W. H. Spooner, Walworth, N. Y., third prize, \$10.

*American Cheeses, Factory or Other, not less than Twenty Pounds in Weight, less than One Year Old.*

- L. L. Wight, Whitesboro, N. Y., first prize, \$30.  
 G. A. Bonfoy, Constableville, N. Y., second prize, \$20.  
 W. H. Spooner, Walworth, N. Y., third prize, \$10.

*Five Imitation English Cheeses.*

- Gerry Bartlett, Laona, N. Y., second prize, \$5.

*Imitation Stilton Cheese.*

- W. H. Spooner, Walworth, N. Y., first prize, \$10.  
 Gerry Bartlett, Laona, N. Y., second prize, \$5.

*Rennets.*

- Mrs. Seth Bonfoy, West Winfield, N. Y., first prize, \$10.  
 A. Stone, Stanwix, N. Y., second prize, \$5.

*Wheaten Bread.*

- S. B. Douglass, Reed's Corners, N. Y., first prize, \$5.  
 E. Van Allen, Bethlehem Centre, N. Y., second prize, \$3.

*Rye Bread.*

- Stryker & Jones, Rome, N. Y., first prize, \$5.  
 E. Van Allen, Bethlehem Centre, N. Y., second prize, \$3.

*Indian or Rye and Indian Bread.*

- Mrs. M. S. Blessing, Slingerlands, N. Y., first prize, \$5.  
 Mrs. Seth Bonfoy, West Winfield, N. Y., second prize, \$3.

*Maple Sugar.*

William F. Ford, West Davenport, N. Y., first prize, \$5.

*Maple Syrup.*

William F. Ford, West Davenport, N. Y., first prize, \$5.

Mrs. W. H. Graves, Blossvale, N. Y., second prize, \$3.

*Preserved Fresh Fruits.*

Charles N. Tuttle, Clockville, N. Y., first prize, \$5.

E. Van Allen, Bethlehem Centre, N. Y., second prize, \$3.

*Pickles in Vinegar.*

E. Van Allen, Bethlehem Centre, N. Y., first prize, \$5.

Phebe M. Glatt, New York Mills, N. Y., second prize, \$3.

*Dried Apples.*

Lewis Brewer, Schenectady, N. Y., first prize, \$5.

Miss L. P. Tennant, Stanwix, N. Y., second prize, \$3.

*Dried Peaches.*

Mrs. C. M. Stone, Blossvale, N. Y., second prize, \$3.

*Dried Whortleberries.*

E. Van Allen, Bethlehem Centre, N. Y., first prize, \$5.

Mrs. C. M. Stone, Blossvale, N. Y., second prize, \$3.

*Dried Raspberries.*

A. Stone, Stanwix, N. Y., first prize, \$5.

Oscar J. Lewis, Schodack Centre, N. Y., second prize, \$3.

*Bee Honey.*

P. Miller, Fredonia, N. Y., first prize, \$5.

W. E. Clark & Son, Oriskany, N. Y., second prize, \$3.

*Extracted or Strained Honey.*

W. E. Clark & Son, Oriskany, N. Y., first prize, \$5.

Miss L. P. Tennant, Stanwix, N. Y., second prize, \$3.

M. M. PARKER, Utica, N. Y.

C. L. SHELDON, Lowville, N. Y.

## DOMESTIC MANUFACTURES.

*Woolen Blankets.*

Mrs. W. C. Burritt, Paris, N. Y., first prize, \$5.

D. C. Besse, Stanwix, N. Y., second prize, \$3.

*All-wool Horse Blankets.*

Mrs. W. H. Graves, Blossvale, N. Y., first prize, \$5.  
 Deloss Wentworth, Mohawk, N. Y., second prize, \$3.

*Woolen Cloth.*

Deloss Wentworth, Mohawk, N. Y., first prize, \$5.  
 Mrs. C. M. Stone, Blossvale, N. Y., second prize, \$3.

*Woolen Flannel.*

Mrs. C. M. Stone, Blossvale, N. Y., first prize, \$5.  
 D. C. Besse, Stanwix, N. Y., second prize, \$3.

*Flannel with Cotton Warp.*

Mrs. C. M. Stone, Blossvale, N. Y., first prize, \$5.  
 Mrs. W. H. Graves, Blossvale, N. Y., second prize, \$3.

*Linsey Woolsey.*

Mrs. C. M. Stone, Blossvale, N. Y., first prize, \$5.

*Cotton and Wool Kersey.*

Mrs. C. M. Stone, Blossvale, N. Y., second prize, \$3.

*Rag Carpet.*

Jared Van Wagenen, Lawyersville, N. Y., first prize, \$5.  
 Mrs. Seth Bonfoy, West Winfield, N. Y., second prize, \$3.

*Hearth Rugs.*

Mrs. C. F. Eldred, New Hartford, N. Y., first prize, \$5.  
 Mrs. Ward Hubbard, Watertown, N. Y., second prize, \$3.

*Double Carpet Coverlets.*

Mrs. C. M. Stone, Blossvale, N. Y., second prize, \$3.

*Linen Cloth.*

Mrs. C. M. Stone, Blossvale, N. Y., second prize, \$3.

*Linen Kersey.*

Mrs. W. H. Graves, Blossvale, N. Y., second prize, \$3.

*Tow Cloth.*

Mrs. W. H. Graves, Blossvale, N. Y., second prize, \$3.

*Knit Bed Spreads.*

Mrs. Ward Hubbard, Watertown, N. Y., first prize, \$3.  
 Mrs. Milton H. Thomson, Utica, N. Y., second prize, \$2.

*White Worked or Quilted Bed Spreads.*

Mrs. B. G. Chapman, Clayville, N. Y., first prize, \$3.  
 Miss L. P. Tennant, Stanwix, N. Y., second prize, \$2.

*Balmoral Petticoats.*

Mrs. O. M. Stone, Blossvale, N. Y., first prize, \$3.  
 Mrs. W. H. Graves, Blossvale, N. Y., second prize, \$2.

*Woolen Knit Stockings.*

Mrs. W. C. Burritt, Paris, N. Y., first prize, \$3.  
 Miss L. P. Tennant, Stanwix, N. Y., second prize, \$2.

*Worsted Knit Stockings.*

Miss L. P. Tennant, Stanwix, N. Y., first prize, \$3.

*Woolen Knit Mittens.*

Mrs. Ward Hubbard, Watertown, N. Y., first prize, \$3.  
 Miss L. P. Tennant, Stanwix, N. Y., second prize, \$2.

*Woolen Fringe Mittens.*

Mrs. O. M. Stone, Blossvale, N. Y., second prize, \$2.

*Linen or Cotton Knit Stockings.*

A. Stone, Stanwix, N. Y., first prize, \$3.  
 Mrs. W. C. Burritt, Paris, N. Y., second prize, \$2.

*Linen Sewing Thread.*

Mrs. W. H. Graves, Blossvale, N. Y., second prize, \$2.

**EXTRA ENTRIES COMMENDED.**

Miss Jenny E. Baker, Marcy, N. Y., Crochet, Worsted and Fancy Work.

Mrs. T. H. Oackett, Deansville, N. Y., Specimen of Chenille Embroidery.

Miss Ophelia K. Shepard, Mohawk, N. Y., Lady's Fancy Work.

The judges in concluding their labors would say that many meritorious exhibits have not received special mention, though deserving of it; but they must stop somewhere in their particularization, and they sum up the whole matter by saying that all who made exhibits in this hall deserve the thanks of the society, and the public, for their work in adding to the attractiveness and interest of the fair of 1879.

E. F. HOWELL, Frankfort, N. Y.,  
 E. L. B. CURTIS, Ithaca, N. Y.

## FLOWERS, PLANTS AND FRUITS.

## FLOWERS—PROFESSIONAL LIST.

*Collections of Out Flowers.*

James Vick, Rochester, N. Y., first prize, \$10.

*Collections of Roses.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$6.

*Twenty-four Roses.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$5.

*Twelve Roses.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$3.

*Collections of Annual Phloxes.* ●

James Vick, Rochester, N. Y., first prize, \$5.

*Twelve Perennial Phloxes.*

James Vick, Rochester, N. Y., first prize, \$3.

*Collections of Verbenas.*

James Vick, Rochester, N. Y., first prize, \$5.

*Twelve Verbenas.*

James Vick, Rochester, N. Y., first prize, \$3.

*American Seedling Verbena.*

James Vick, Rochester, N. Y., first prize, \$1.

*Collections of Asters.*

James Vick, Rochester, N. Y., first prize, \$3.

George Boyce, Utica, N. Y., second prize, \$2.

*Collections of Lilies.*

James Vick, Rochester, N. Y., first prize, \$3.

*Collections of Pansies.*

Albert Dohles, Waterloo, N. Y., first prize, \$3.

*Collections of Ten-weeks' Stocks.*

James Vick, Rochester, N. Y., first prize, \$3.

*Collections of Gladiolus.*

James Vick, Rochester, N. Y., first prize, \$3.

*Twelve Varieties of Gladiolus.*

James Vick, Rochester, N. Y., first prize, \$2.

## AMATEUR LIST.

*Collections of Cut Flowers.*

Miss L. P. Tennant, Stanwix, N. Y., first prize, \$10.

E. Van Allen, Bethlehem Centre, N. Y., second prize, \$5.

*Collections of Dahlias.*

Miss L. P. Tennant, Stanwix, N. Y., first prize, \$6.

A. Stone, Stanwix, N. Y., second prize, \$3.

*Collections of Roses.*

Miss L. P. Tennant, Stanwix, N. Y., first prize, \$6.

*Six Roses.*

Miss L. P. Tennant, Stanwix, N. Y., first prize, \$2.

*Collections of Verbenas.*

E. Van Allen, Bethlehem Centre, N. Y., first prize, \$5.

A. Stone, Stanwix, N. Y., second prize, \$3.

*Twelve Verbenas.*

A. Stone, Stanwix, N. Y., first prize, \$3.

E. Van Allen, Bethlehem Centre, N. Y., second prize, \$2.

*Six Verbenas.*

Miss L. P. Tennant, Stanwix, N. Y., first prize, \$2.

E. Van Allen, Bethlehem Centre, N. Y., second prize, \$1.

*Collections of Phloxes.*

E. Van Allen, Bethlehem Centre, N. Y., first prize, \$5.

Miss L. P. Tennant, Stanwix, N. Y., second prize, \$3.

*Collections of Asters.*

E. Van Allen, Bethlehem Centre, N. Y., first prize, \$3.

A. Stone, Stanwix, N. Y., second prize, \$2.

*Collections of Pansies.*

Miss L. P. Tennant, Stanwix, N. Y., first prize, \$3.

E. Van Allen, Bethlehem Centre, N. Y., second prize, \$2.

*Collections of Ten Weeks' Stocks.*

A. Stone, Stanwix, N. Y., first prize, \$3.

Miss L. P. Tennant, Stanwix, N. Y., second prize, \$2.



*Collections of Gladiolus.*

- E. Van Allen, Bethlehem Centre, N. Y., first prize, \$3.  
 A. Stone, Stanwix, N. Y., second prize, \$2.

*Collections of Everlasting Flowers.*

- A. Stone, Stanwix, N. Y., first prize, \$3.  
 Miss L. P. Tennant, Stanwix, N. Y., second prize, \$2.

## BOUQUETS, FLORAL DESIGNS, ETC.— OPEN TO ALL.

*Hand Bouquets.*

- Ellwanger & Barry, Rochester, N. Y., first prize, \$5.

*Table Bouquets.*

- Ellwanger & Barry, Rochester, N. Y., first prize, \$5.

*Button-hole Bouquets.*

- Miss L. P. Tennant, Stanwix, N. Y., first prize, \$3.  
 E. Van Allen, Bethlehem Centre, N. Y., second prize, \$2.

*Baskets of Flowers.*

- Ellwanger & Barry, Rochester, N. Y., first prize, \$5.  
     P. R. QUINLAN, Syracuse.  
     E. W. HOPKINS, Little Falls.

## FRUITS — PROFESSIONAL LIST.

*Collections of Apples.*

- Ellwanger & Barry, Rochester, N. Y., first prize, \$10.

*Twenty Varieties of Apples.*

- Ellwanger & Barry, Rochester, N. Y., first prize, \$8.

*Ten Varieties of Apples.*

- Ellwanger & Barry, Rochester, N. Y., first prize, \$5.

*Collections of Pears.*

- Ellwanger & Barry, Rochester, N. Y., first prize, \$15.  
 W. Garlock, Utica, N. Y., second prize, \$10.

*Twenty Varieties of Pears.*

- Ellwanger & Barry, Rochester, N. Y., first prize, \$10.

*Ten Varieties of Pears.*

- Ellwanger & Barry, Rochester, N. Y., first prize, \$5.

*Collections of Peaches.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$5.

*One Variety of Peaches.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$2.

*Collections of Plums.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$5.

*Five Varieties of Plums.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$3.

*One Variety of Plums.*

D. S. Marvin, Watertown, N. Y., first prize, \$2.

Ellwanger & Barry, Rochester, N. Y., second prize, \$1.

*Quinces.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$2.

*Collections of Native Grapes.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$10.

D. S. Marvin, Watertown, N. Y., second prize, \$5.

*Five Varieties of Native Grapes.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$5.

T. Ward, Utica, N. Y., second prize, \$3.

*Collection of Foreign Grapes.*

T. Ward, Utica, N. Y., second prize, \$5.

## FRUITS — AMATEUR LIST.

*Twenty Varieties of Apples.*

J. Van Dorn, Ithaca, N. Y., first prize, \$10.

A. S. Johnson, Chili Station, N. Y., second prize, \$5.

*Ten Varieties of Apples.*

J. Van Dorn, Ithaca, N. Y., first prize, \$5.

J. Houck, New Hartford, N. Y., second prize, \$3.

*Five Varieties of Apples.*

J. Van Dorn, Ithaca, N. Y., first prize, \$3.

E. Van Allen, Bethlehem Centre, N. Y., second prize, \$2.

*Ten Varieties of Pears.*

M. E. Myers, Charlton, N. Y., second prize, \$3.

*Five Varieties of Pears.*

M. E. Myers, Charlton, N. Y., first prize, \$3.

A. S. Johnson, Chili Station, N. Y., second prize, \$2.

*Five Varieties of Peaches.*

E. Van Allen, Bethlehem Centre, N. Y., second prize, \$2.

*One Variety of Peaches.*

E. Van Allen, Bethlehem Centre, N. Y., second prize, \$1.

## FRUITS — SINGLE DISHES — OPEN TO ALL.

*Apples — Fall Pippins.*

E. Van Allen, Bethlehem Centre, N. Y., first prize, \$2.

*Gravensteins.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$2.

*Baldwins.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$2.

*King of Tompkins County.*

C. W. Eells, Clinton, N. Y., first prize, \$2.

*Rhode Island Greenings.*

C. W. Eells, Clinton, N. Y., first prize, \$2.

*Twenty Ounce.*

C. W. Eells, Clinton, N. Y., first prize, \$2.

*Pears — Bartlett.*

J. Van Dorn, Ithaca, N. Y., first prize, \$2.

*Beurre d'Anjou.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$2.

*Beurre Clairgeau.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$2.

*Beurre Bosc.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$2.

*Duchesse d'Angouleme.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$2.

*Doyenne Boussock.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$2.

*Flemish Beauty.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$2.

*Seckel.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$2.

*Sheldon.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$2.

*Lawrence.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$2.

*Winter Nelis.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$2.

*Grapes — Concord.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$2.

*Delaware.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$2.

*Hartford.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$2.

*Any of Rogers' Varieties.*

Ellwanger & Barry, Rochester, N. Y., first prize, \$3.

JOHN J. THOMAS, Union Springs, N. Y.  
ROBERT BURNET, London, Ca.

1879.

ABSTRACTS OF TREASURER'S REPORTS.  
COUNTY AGRICULTURAL SOCIETIES.

COUNTIES.	Balance from 1878.	Receipts.	Premiums.	Expenses.	Balance to 1880.	Remarks.
Allegany .....	\$302 67	\$1,468 28	\$732 25	\$1,033 85	\$4 85	
Broome .....	25	3,268 07	1,795 81	1,462 21	10 30	
Cattaraugus .....	151 69	1,296 25	607 10	709 02	131 82	
Chautauqua .....	214 81	3,784 10	1,650 00	2,228 55	80 36	Purses, \$482.50.
Chemung .....	17 21	2,981 68	1,284 00	1,569 49	128 19	
Chenango .....	307 45	1,047 40	879 00	442 04	33 81	
Columbia .....	16 10	1,517 10	670 96	836 51	45 73	
Cortland .....	.....	.....	.....	.....	.....	Not received.
Delaware .....	150 10	1,190 32	1,019 43	321 99	.....	Purses, \$175.
Dutchess .....	95 89	1,717 75	838 75	967 39	7 23	
Erie .....	280 60	3,369 17	1,490 75	1,878 76	280 28	
Essex .....	538 02	3,136 93	1,644 25	869 00	1,161 70	Purses, \$335.
Franklin .....	551 69	1,477 64	838 21	819 52	371 60	Purses, \$500.
Fulton .....	70 64	5,190 10	2,598 00	2,175 95	486 79	Purses, \$1,500.
Genesee .....	69 99	2,501 33	963 50	2,277 85	329 97	
Greene .....	7 59	2,331 39	1,190 00	998 90	160 08	
Herkimer .....	1,037 83	2,532 48	1,260 53	1,398 92	910 86	
Jefferson .....	255 29	2,208 50	818 50	1,628 75	16 54	
Lewis .....	.....	4,363 66	2,632 45	1,600 39	130 82	
Livingston .....	131 20	1,893 05	887 25	1,003 54	132 46	
	8 36	1,967 32	718 00	1,027 91	229 77	

Monroe.....	6,472 87	2,704 00	3,768 87	.....	.....	Purses, \$450.
Montgomery.....	399 64	1,516 00	1,967 92	232 17	.....	
New York (American Inst.)	6,195 04	1,621 28	22,606 02	52,605 58	.....	
Niagara.....	452 01	1,202 50	1,373 04	869 15	.....	Purses, \$355.
Oneida.....	268 54	1,605 18	1,535 90	321 83	.....	Purses, \$702.50.
Onondaga.....	.....	.....	.....	.....	.....	Incomplete.
Ontario.....	517 98	1,115 98	714 61	874 74	.....	
Orange.....	Old balance to duking fund.	1,534 00	867 47	57 56	.....	
Orleans.....	.....	.....	.....	.....	.....	Not received.
Oswego.....	*906 72	1,005 95	2,821 23	*1,475 65	.....	
Otsego.....	28 20	1,608 02	763 02	623 97	.....	
Putnam.....	31 00	1,308 88	228 00	55 35	.....	Purses, \$480.
Queens.....	479 04	5,098 00	4,905 26	705 95	.....	
Rockland.....	.....	.....	.....	.....	.....	Not received.
St. Lawrence.....	*12 85	2,715 50	3,103 19	*837 77	.....	Purses, \$1,255.
Saratoga.....	77 01	723 00	1,460 59	83 24	.....	Purses, \$166.
Schenectady.....	161 17	1,278 00	859 85	*115 40	.....	Purses, \$633.
Schoharie.....	228 37	601 00	1,532 95	275 77	.....	
Schuyler.....	.....	.....	.....	.....	.....	Not received.
Seneca.....	368 63	885 50	656 46	594 96	.....	
Steuben.....	90 13	1,553 75	2,631 61	80 74	.....	
Sullivan.....	63 78	342 75	198 49	166 20	.....	
Suffolk.....	4 51	1,055 00	1,438 27	*18 82	.....	
Tioga.....	142 70	566 58	735 36	199 81	.....	
Tompkins.....	81 40	423 25	1,825 86	19 04	.....	
Ulster.....	.....	.....	.....	.....	.....	No fair.
Warren.....	1,017 37	1,381 70	1,197 85	1,167 31	.....	Purses, \$260.
Washington.....	599 63	1,810 85	3,087 93	67 87	.....	
Wayne.....	384 81	475 50	200 86	749 80	.....	
Wyoming.....	34 41	789 00	588 48	.....	.....	
Yates.....	Old balance to mortgage acct.	1,042 25	1,264 01	6 00	.....	

\* Indicates debit balances.

## MADISON COUNTY TOWN SOCIETIES.

NAME.	Balance from 1878.	Receipts.	Premiums.	Expenses.	Balance to 1880.	Remarks.
Brookfield .....	\$435 72	\$1,250 17	\$714 10	\$512 93	\$458 86	
Hamilton .....	852 48	728 07	438 75	772 79	369 01	
Lenox .....	.....	2,586 70	726 75	1,895 48	*35 53	

## INDIAN AGRICULTURAL SOCIETIES.

Cattaraugus.....	.....	1,439 75	620 62	819 13	.....	
Onondaga.....	61 00	457 00	250 75	342 13	*74 22	
Tonawanda.....	.....	479 40	379 40	100 00	.....	

## REPORTS OF CROPS, SEASON 1879.

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### ALLEGANY COUNTY — H. E. DUDLEY, SECRETARY.

The season was favorable to agriculture in this county. The crops, with the exception of hay, yielded an abundant harvest. Cheese and butter making has greatly increased in the county within the past few years, and now forms one of the most important parts of our industry.

### BROOME COUNTY — MILO B. ELDRIDGE, SECRETARY.

Owing to want of rain the season was not favorable for crops of *all* kinds, yet the farmer has been well rewarded. Wheat was light; corn, oats and buckwheat good; potatoes immense; fruit very light; hay good.

### CHAUTAUQUA COUNTY — L. W. WILTZIE, SECRETARY.

The past season has not been as profitable as usual; crops poorer than for several years past; about 25 per cent less than the average. The apple crop, however, was unusually large, and prices good.

### CHEMUNG COUNTY — W. A. WARD, SECRETARY.

The extreme drought extending through most of the season has been disastrous to all late crops. Butter and cheese have fallen off very much from want of pasturage; fruit crop nearly a failure, the severe frosts in May having destroyed blossoms and germs.

### DELAWARE COUNTY — J. B. HONEYWELL, SECRETARY.

The season has been good. Hay was a large crop; potatoes and grain of all kinds equally large, but apples not so large a crop as last year.

### FRANKLIN COUNTY — S. A. BEEMAN, SECRETARY.

The weather during the past season was, on the whole, favorable to the crops, potatoes especially doing well, and bringing fair prices in market. The hop crop has been much smaller of late, many farmers plowing up their fields on account of the low prices ruling in '77, '78. The remaining yards were in most instances neglected, yet the crop on the whole was of more than average quality, and has brought to them who have sold very profitable return.



**FULTON COUNTY — J. J. DAVIDSON, SECRETARY.**

Hay crop good, heavier and of better quality than last year, also corn and buckwheat, especially the latter; potatoes would have been a heavy crop but for the rot. Heavy rains in the early part of September with continued warm weather, has been the cause of this rot.

**GENESEE COUNTY — NELSON BOGUE, SECRETARY.**

The past season has been an unusually productive one without exception. The fruit crop especially large and fine, and will add to the material wealth of the county at least half a million of dollars.

**HERKIMER COUNTY — JOSIAH SHULL, SECRETARY.**

The season has been favorable. Wheat exceeds any thing grown in the past thirty years; grass crop not so large as in 1878, but of superior quality; fruit crop an average one; cheese and butter an average, but considerably smaller than last year.

**LIVINGSTON COUNTY — WM. A. BRODIE, SECRETARY.**

A fair average yield of all crops throughout the county.

**NIAGARA COUNTY — LEWIS H. HILL, SECRETARY.**

Fruit crop good; potatoes very fair; wheat good, quality never better, although troubled in some places by the Hessian fly; corn very good; barley average; oats good; hay below average.

**ONONDAGA COUNTY — P. H. AGAN, SECRETARY.**

Wheat half crop, quality fair; corn about the average and good; barley, ditto; oats above the average and good; hay half a crop, but the quality good; potatoes heavy yield, and sound; tobacco a good crop and quality excellent. With the exception of apples, fruits were abundant.

**ONTARIO COUNTY — GEO. W. JOHNSON, SECRETARY.**

The season was an average one and crops about same as former years.

**ORANGE COUNTY — D. A. MORRISON, SECRETARY.**

The oat crop was injured by the drought; corn was a bountiful crop, and potatoes, in spite of the insect plague, yielded well; hay good quality, but below the average; apples scarce and inferior, but other fruits about an average.

### ORLEANS COUNTY — L. H. BEACH, SECRETARY.

Crops throughout the county have been unusually large; grains run far above the average, and vegetables yielded well; fruit crop better than for years.

### OSWEGO COUNTY — M. W. COLLINS, SECRETARY.

Some parts of the county suffered from the drought, but the yield of various crops is better than usual.

### ST. LAWRENCE COUNTY — A. T. MARTYN, SECRETARY.

The season, as a whole, was very favorable. Hay crop unusually large, and got in in excellent condition; winter wheat very fine, but owing to drought, all spring grains were light in both straw and grain; corn about half a crop; potatoes fair and yield good; bug did not damage as much as in previous years; apple crop the largest ever seen in the county.

### SCHOHARIE COUNTY — B. W. STAFFORD, SECRETARY.

The season has been a good one; corn, rye, oats, all fair; potato crop very large and very fine; hops about two-third yield and of very fine quality, the high price and ready sale more than compensating for the deficiency. With the exception of apples, fruits of all kinds were in abundance.

### SENECA COUNTY — W. W. STACKY, SECRETARY.

Crops generally fair, except wheat, which was below the average; corn extra good, both of grain and stalk; hay short and clover seed an entire failure owing to the ravages of an insect very similar to the wheat fly; potatoes very abundant and good quality; apples light crop; rest of the fruits a good average.

### STEUBEN COUNTY — R. E. ROBIE, SECRETARY.

The season has been very satisfactory to the husbandman. With the exception of grass, the yield of all crops has been larger than for some time.

### SULLIVAN COUNTY — GEO. W. DECKER, SECRETARY.

Owing to drought the past season was not up to the average for grain crops; rye scarcely more than half a crop; oats a fair crop; buckwheat a good crop; potatoes rotted badly, otherwise would have been a large crop.

### SUFFOLK COUNTY — N. W. FOSTER, SECRETARY.

The crops of the county have been good with scarcely an exception. The abundance of cauliflower raised here has induced parties

to erect establishments in Riverhead for pickling the flowers, from whence they are shipped all over the world.

**TOMPKINS COUNTY — O. P. HYDE, SECRETARY.**

The season has been a very dry one; wheat not more than half a crop; barley nearly a full crop and quality good; oats not more than two-thirds, but quality good; corn about half a crop; potatoes nearly a full crop and quality never better, no signs of rot; hay about half a crop; buckwheat the same.

**ULSTER COUNTY — R. LOUGHRAN, SECRETARY.**

In crops generally the county has produced rather above the general average.

**WARREN COUNTY — T. S. KETCHUM, SECRETARY.**

The season was very favorable and as a result all the staple products showed good yields.

**WASHINGTON COUNTY — E. HOWARD CROCKER, SECRETARY.**

The season as a whole has been favorable and crops yield up to the average. The yield of potatoes was immense, more than an average as compared even with the production prior to the advent of the beetle.

**WAYNE COUNTY — J. S. ROYS, SECRETARY.**

The season of 1879 has been favorable for the growth of almost all farm products in this county. Wheat crop was not so large as last year, but barley and oats average crops; small clover seed crop is almost an entire failure, owing to grub in the root and weevils in the head; potatoes a large crop; corn rather below the average; essential oils not so large, as the crop planted was small, owing to low prices; apple crop light.

**WYOMING COUNTY — FRANK LEWIS, SECRETARY.**

The season has been favorable and crops abundant. Wheat, which for years has not done well, yielded 25 and 30 bushels to the acre and other cereals in proportion; fruits have outdone themselves in bearing properties and the county is full of it; cheese, one of our staple products at the present time, is "just booming," ranging from 4½c. to 11c. per lb. during the season.

**YATES COUNTY — J. D. MORGAN, SECRETARY.**

The past season generally a productive one. Wheat about an average crop; more barley sown than last year and the crop is generally good; corn good where properly cultivated; oats good, but not a large crop; potatoes largest crop for years and good; hay light, almost a failure; apple crop small and poor.

**SPECIAL REPORT**  
**OF**  
**NEW YORK STATE SURVEY**  
**ON THE**  
**PRESERVATION OF THE SCENERY**  
**OF**  
**NIAGARA FALLS,**  
**AND**  
**FOURTH ANNUAL REPORT ON**  
**THE TRIANGULATION OF THE STATE**  
**FOR THE YEAR 1879.**

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**JAMES T. GARDNER, DIRECTOR.**

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**ALBANY:**  
**CHARLES VAN BENTHUYSEN & SONS.**  
**1880.**



# STATE OF NEW YORK.

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No. 86.

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## IN ASSEMBLY,

MARCH 22, 1880.

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### FOURTH REPORT

OF THE BOARD OF COMMISSIONERS OF THE STATE  
SURVEY, AND REPORT OF THE DIRECTOR, FOR THE  
YEAR 1879.

OFFICE OF THE BOARD OF COMMISSIONERS OF THE }  
STATE SURVEY, ALBANY, *March 22, 1880.* }

*To the honorable*

*the Legislature*

*of the State of New York:*

I have the honor to transmit a Special Report of the Commissioners of the State Survey, on the Preservation of the Scenery around Niagara Falls, in accordance with a concurrent resolution of the Legislature of May 19, 1879, and the Fourth Report of the Board, containing their proceedings during the year 1879, as required by the statutes organizing the said Board.

I remain, very respectfully,

Your obedient servant,

HORATIO SEYMOUR,

*President of the Board.*



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Drawn by Francis Lathrop and engraved by Mr. Marsh.
- Plate II. General view of Niagara Falls and Goat Island. .... Heliotype print.
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- Plate X. View in the primeval woods, on Goat Island.  
Drawn by Thomas Moran; engraved by Mr. Karst.

### VIEW SHOWING THE DISFIGUREMENT OF THE CANADIAN SHORE.

- Plate XI. Brink of Horse Shoe Falls and Canadian Shore, seen from Goat Island.  
Heliotype print.

### PLATE ACCOMPANYING FATHER HENNEPIN'S DESCRIPTION.

Fac-simile of the first picture of Niagara Falls; published in 1698.  
Photo-lithograph from the original

## MAPS.

- Map showing the recession of Niagara Falls.
- Topographical Map of the region about Niagara Falls, showing the proposed State Reservation.
- Part of the Official Property Map of Niagara Falls Village, showing the lots and streets included in the proposed State Reservation.

## PART II.

- Map of Central and Eastern New York, showing the results of the Survey.
- Map of the triangulation along the Hudson River.

NOTE.—The heliotype prints are from photographic negatives taken by Mr. George Barker, of Niagara Falls. The prints are by the Heliotype Printing Company, of Boston.

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PART I.

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SPECIAL REPORT

ON THE

PRESERVATION OF NIAGARA FALLS.

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RESTORED.

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# SPECIAL

## REPORT OF THE COMMISSIONERS.

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### *To the Legislature :*

The Commissioners of the State Survey were instructed by a joint resolution of the Legislature of 1879, as follows :

*“ Resolved, That the Commissioners of the State Survey are hereby directed to inquire, consider and report what, if any, measures it may be expedient for the State to adopt for carrying out the suggestions contained in the annual message of the Governor, with respect to Niagara Falls. That said Commissioners are hereby authorized, in behalf of the State, to confer with any commission or other authorized body, person or persons representing the Dominion of Canada or the Province of Ontario, making a similar inquiry or contemplating measures for a similar purpose.”*

### I.

Under this resolution it became the duty of the Commissioners to ascertain how far the private holding of land about Niagara Falls has worked to public disadvantage through defacements of the scenery ; to determine the character of such defacements ; to estimate the tendency to greater injury ; and lastly, to consider whether the proposed action by the State is necessary to arrest the process of destruction and restore to the scenery its original character.

In pursuance of these objects, the Commissioners instructed Mr. James T. Gardner, Director of the State Survey, to make an examination of the premises and prepare for their consideration such a project as was had in view in the resolution of the Legislature, and they associated with him Mr. Frederick Law Olmsted.

## II.

Before stating the conclusions reached on the topics of inquiry above recited, a brief consideration seems desirable of a matter not directly comprehended in the instructions of the Commissioners, but so related to those to be reported upon and of such public concern, that reference to it cannot properly be omitted.

Apart from the profound interest which belongs to the great Falls, the river scenery of Niagara has many charms peculiar to itself. As with charms of scenery elsewhere, these are hardly to be known at first sight and are the more enjoyed the more they are courted. The summer climate of the region is most agreeable and those coming to it from the seaboard experience a decided tonic effect, as of mountain air. It is accessible by several favorite routes of travel, its inns are of good repute, their sanitary conditions uncommonly satisfactory, and their charges not higher than rule elsewhere.

Under these circumstances it might reasonably have been expected that Niagara would be the temporary residence of great numbers of those who every summer migrate from town to country, and one of the most popular places of vacation sojourn in all the world.

It has, however, no summer population of the class referred to, and though it receives a great number of transient visitors, it is believed that at no other notable pleasure resort of Europe or America is the stay of travelers so short. It may be added that, if the public press for years past is to be credited, from none do so many visitors depart in ill-humor. The explanation is generally assumed to be that they are driven away by the pestering demands and solicitations, the petty exactions and impositions to which, whenever a stranger goes out of doors, he is at every turn subjected. This nuisance is spoken of as if it were in a great degree peculiar to Niagara; the local authorities are considered responsible for it and are urged to bring it to an end by better and more resolutely enforced police regulations.

Both the explanation and the remedy thus proposed appear to the Commissioners inadequate. Wherever scenery of great general celebrity attracts strangers in large numbers, a similar inconvenience is felt to a greater or less extent, and at many places the population which, under various pretences, seeks to obtain a livelihood through the offer of various small services to visitors, and when this fails by more direct forms of begging and depredation, is much larger than at Niagara. It is indeed incredible that the people of these rich







corners of the prosperous State of New York and the thrifty Province of Ontario should either be moved in extraordinary numbers to adopt such courses of life, or to exhibit in them a degree of rapacity elsewhere unknown.

Why, then, the evil should apparently be more felt by the public, and have such an unusual result as is attributed to it at Niagara, demands inquiry.

The question has too many minor branches to be thoroughly pursued in this report, but the following considerations appear to have more importance than has generally been recognized.

Within certain limits at Niagara there are probably a larger number of distinct and rare qualities of beauty in combinations of rock, foliage, mist, sky and water, than in any other equal space of the earth's surface, and although the gorge of the river for miles below is very interesting, and the broad, smooth water about the Rapids, with its low shores, is an important feature of a marvelous landscape effect, the grounds of attraction in these more distant parts being more nearly paralleled elsewhere, the distinctive interest of Niagara, as compared with that of other attractive scenery, is remarkably circumscribed and concentrated.

The difference in the demand upon the attention of such a passage of scenery and that required by scenery of mountain grandeur, is plain. In the latter the elements of beauty are much diffused; are to be enjoyed on all sides and in great distances, and, because of this pervading quality of its beauty, such scenery is not as much to be put out of countenance by the intrusion on the attention of incongruous objects or of impertinent palaver. Much pleasure may be taken in it while the observer is in rapid motion and even incidentally to other occupations; and a like comparison will hold as to the enjoyment of regions simply picturesque or those of more tranquil beauty.

The courses into which visitors are now generally drawn at Niagara, the facilities of conveyance offered them, and all the arrangements ostensibly designed for their aid, and for which they are constantly called upon to pay, are sufficiently well adapted to the bare satisfaction of curiosity in the waterfall as the largest in the world, and in those wonders of it which can be adequately set forth in words. Were nothing more desirable, the interruptions with which the visitor is now annoyed would be of little consequence.

But the value of Niagara to the world, and that which has obtained

for it the homage of so many men whom the world reveres, lies in its power of appeal to the higher emotional and imaginative faculties, and this power is drawn from qualities and conditions too subtle to be known through verbal description. To a proper apprehension of these, something more than passing observation is necessary ; to an enjoyment of them, something more than an instantaneous act of will.

It is then conceivable that whatever occurs to prevent or interrupt a composed, receptive and contemplative frame of mind is, at Niagara, a source of deeper irritation, offense and dissatisfaction than it can be elsewhere.

As to a possible remedy for the evil, it should be remembered that the local government is in the hands of two essentially rural communities, between whom travelers are constantly passing ; that the difficulty of concerting adequate measures for the protection of wayfarers from imposition and annoyance on the highways is the greater, because the two live under different national constitutions and different municipal laws and customs.

Could both the ordinary and these extraordinary difficulties be overcome, of providing, under such communities, an efficient police and magisterial system during the few months in which visitors flock in large numbers to the Falls, the points of interest of most importance would still mainly remain private property, divided among numerous land-owners, recognizing little interest in common, but each, as now, seeking to gain all he can through rents, fees, and a division of earnings with all sorts of petty speculators on the ignorance of strangers.

While these conditions continue, therefore, whatever temporary palliations of the evil may possibly be accomplished, it is likely in the long run to be aggravated and to operate still more decidedly to neutralize the proper public value of Niagara Falls. The only prospect of relief, or even of permanent and general improvement, lies in the adoption of some such measure as the Commissioners have been directed by the Legislature, for other reasons, to consider.

### III.

Taking up the matters with which the Commissioners were more particularly charged, the report of Mr. Gardner, hereto appended, shows that the scenery of Niagara Falls has been greatly injured,



AMERICAN FIELDS AND FOREST: PARK SCENE.





that the process of injury is continuous and accelerating, and that, if not arrested, it must in time be utterly destructive of its value.

The American shore is occupied by a village, and the land bordering the river has been divided into house lots. Many of these are already built upon: all are liable to be. There is no American soil from which the Falls can be contemplated except at the pleasure of a private owner and under such conditions as he may choose to impose; none upon which the most outrageous caprices of taste may not be indulged or the most offensive interpolations forced upon the landscape.

From the head of the Rapids to the Falls, the shore is already defaced by walls, platforms and buildings. Not a foot of it retains a natural character.

Years ago one of the loveliest features of the river was a little island with rocky shores overhung with foliage, in the dark shadows of which the waters whirled and sparkled as nowhere else. A small paper mill, at first set inconspicuously upon it, has been gradually enlarged and built out, until now it has not merely displaced the rock and wood, but stretches its sluice-ways, walls and wing-dams far into the most interesting part of the American Rapids.

The single fragment of the majestic primeval forest of the Falls which still remains, upon Goat Island, will probably soon pass from the protection of its present owners and be destroyed, to make room for gaudy places of popular entertainment or unsightly factories.

It must be expected that the subdivision of properties will be a continuous process and that each land owner will, hereafter as heretofore, strive to make his particular ground yield the largest possible private profit.

The elements of interest and attraction lie within such a limited area and so react on one another, that a like process might, as already suggested, extend much further in any other region of great landscape celebrity with less fatal effects upon its character.

#### IV.

The rational remedy is of the same class with that which it is the policy and custom of all civilized communities to adopt whenever the private ownership of land stands in the way of general interests, as when public highways or canals are carried through farms and buildings, or when private ferries are supplanted by free public bridges.

To give satisfactory access to the Falls of Niagara and preserve their value, the extent of land requisite to be withdrawn from private ownership is fortunately small. The area which Messrs. Gardner and Olmsted find necessary to be taken for these purposes, includes, besides the islands above the Falls, a strip of the river bank on the main land commencing at the head of the rapids and running along the shore to the upper suspension bridge. The breadth of this strip is mainly determined by the crest of a natural terrace generally about a hundred feet distant from the water's edge, but so much wider in the immediate vicinity of the Falls that at the point of greatest interest, a spacious area would be obtained for the accommodation of visitors, and incongruous objects would be more effectually kept out of sight.

It is designed that the buildings now standing upon this strip of land shall be removed, and that the immediate bank of the river shall be formed so as to have a natural aspect, with such slopes and so protected by rough, loosely piled local rock, as to be guarded against surges of floating ice and logs. Trees and bushes are proposed to be planted of such kinds and in such dispositions as are natural to the locality. Carried back to the boundary on the crest of the terrace, this planting would obscure the buildings of the village, and secure their landscape disconnection with the river.

Within and along the rear of the narrow woodland, a road and walk would be laid out with branches from the walk to inconspicuous, shaded seats commanding views of the Rapids, and to a more extended platform overlooking the Falls and chasm.

## V.

The above suggestions indicate the considerations which determine the limits of the land proposed to be taken. Except with this motive, it is not the duty of the Commissioners to advise how it shall be used, and it is sufficient to say that they cordially adopt the views of Mr. Olmsted, who urges that the State should by no means undertake to provide a place of general pleasuring or any merely ornamental grounds, but simply to remove unnecessary artificial objects; make those necessary as little conspicuous as possible, and restore natural landscape conditions as far as practicable consistently with indispensable provisions for the conveyance of visitors and for giving them adequate opportunities for observation.



VILLAGE SEEN FROM CLIFF - MICHIGAN FALLS





The main grounds of this advice are thus stated :

In whatever is done by the State there should be not only a wise consideration of immediate public requirements, but a prudent forecast of the future. When once visitors are relieved as far as may be from their present annoyances, the increasing population of the country and the multiplication and cheapening of the means of travel which is to be anticipated, will bring people to Niagara Falls in numbers far exceeding those of which we have present experience. Even now it often happens that several hundred visitors seek at the same time to enjoy a particular view of the Falls which can only be had from a space of ground much too limited for them all to stand upon at once. In view of this consideration, it is obvious that to provide, with a single purpose, for the comfortable passing to and from the most popular points of view and for the standing room at these points of such multitudes as must be looked forward to, without ruinous sacrifice of the scenery, will be a task, to say the least, of extreme difficulty. It should be complicated by no other object, and all practicable legislative safeguards should, from the outset, be employed to prevent the introduction of such other objects as, under various pretences, are likely from time to time to be urged.

The distance from existing hotels and shops in the village to the most distant parts of the proposed State grounds is but a thousand yards. It will, therefore, be a hardship to no one if this ground is kept entirely free from houses of refreshment, shops, booths, and places of amusement and exhibition. Neither can extensive shelters be necessary. At one or two points something might be gained by the erection of belvederes or prospect towers, but if it is considered how conspicuous any structure of this class must be if conveniently spacious for the general public, it will be evident that even these will be better dispensed with.

## VI.

The removal and exclusion from the proposed State ground of everything interfering unnecessarily with the contemplation of the natural scenery will injure no general interest. Since the building of the paper mill, to which reference has been made, a channel has been formed by means of which a great volume of water is diverted from the stream above the Rapids and carried through the village to the table-land overlooking the chasm below the Falls, where the power

can be applied to the greatest mechanical advantage. It is already in extensive use, and it is admitted by the proprietors of the paper mill proposed to be removed, that the situation would be even more favorable for their purposes than that they now occupy, or than any upon the ground of which it is proposed that the State should take possession. This would be equally true as to any considerable industrial undertaking. The provision thus secured can be enlarged, should this ever be required, to any desired extent, and the water power of the Falls more economically utilized than if their immediate banks were to be occupied by factories.

## VII.

Before passing judgment on the project, the Commissioners have taken all practicable pains to be informed of the market value of the properties required to be taken. They do not present estimates because they could offer none that would not be in a great degree conjectural; and, with a view to the course which they will herein suggest to the Legislature, not of immediate importance. They point out, however, that the project stands on a much more favorable footing than it otherwise could, from the fact that the lines of the proposed State ground are so laid down as to leave out, not only the principal water works, factories and shops for which the Falls have given occasion, but also much the larger part even of the structures provided expressly for visitors. Comparatively little capital invested in improvements would, therefore, have to be bought out. The consideration is also important that the proposition excludes any future costly constructions or elaborate arrangements for the entertainment of the public, and any occasion for licenses or leases which might be corruptly dealt with.

The Commissioners are of the opinion that the real estate required could now be obtained, and the undertaking carried out at a cost less than has been commonly supposed, and which would not be thought by the people of the State to be immoderate.

## VIII.

Reviewing the scheme as a whole, the following comments are submitted to the Legislature :

Judged from the lowest point of view, States possess in the interest of their physical features sources of great public and private income.



DISFIL' RED BANKS  
VILLAGE SHORE OF PIER AMELIA N. RIVER





Though more striking proofs might be found abroad, we need not go beyond the limits of our own State for sufficient illustrations of this fact. There can be few intelligent citizens of New York who are not aware from personal observation that a large and rapidly augmenting revenue is flowing into all its channels of business and into the public treasury, because of the attractions which the people of other States and countries find in the scenery of the Hudson, the Mohawk, the Susquehanna, the Delaware and the Genesee ; of Lake Champlain, Lake George and numerous smaller bodies of water ; the Thousand Islands of the St. Lawrence ; the mountain and forest wilds of the Adirondacks, and the picturesque glens and cascades of the central part of the State. Niagara Falls is not simply the crowning glory of the great resources of the State of this class, but the highest distinction of the nation and of the continent. No other like gift of nature equally holds the interest of the world at large or operates equally as an inducement to the crossing of the ocean. Its eminence is shown by the remarkable circumstance that the word Niagara has become incorporated into many languages as better than any other expressing ideas of which the facts of Niagara are the highest known exemplification.

The private land ownership and individual enterprise, which elsewhere work favorably to the interests of the State by aiding the purpose of travelers, at Niagara stand in its way. The evil is not one that can cure itself. It is sure, if it continues to increase. The pecuniary loss from it to the people of the State is incalculably greater than the outlay which would be required to carry out the scheme proposed and bring it to an end.

But the question cannot be regarded simply as an economical one. It has been fully recognized by wise men in all times and in all lands, to be conducive to civilization, to the instruction of the people and to the conservation of public order, that localities which are associated with the lives, the achievements and the deaths of distinguished men should be set apart, preserved and held as a sacred heritage to be transmitted from one generation to another. In the same way gifts of nature which appeal to the higher sensibilities of mankind by their beauty and by their grandeur, are entitled to reverential protection. Americans go to Europe not only to visit the burial places of the great men of past generations but also to see the valleys of the Rhine and the Danube ; the mountains of Switzerland, and the shores of the Mediterranean. The impulses which thus draw the nations together are a

powerful influence for the obliteration of race-prejudices, and thus for the preservation of the peace of the world.

There is nowhere a natural object better adapted to serve these great ends than the Falls of Niagara, and the State which holds such a treasure, holds it under sacred obligations to mankind.

The memorial hereto appended exhibits the interest which the proposition excites in the minds of many thoughtful men beyond the limits of the State.

It cannot be doubted that another generation will hold us greatly to account if we so neglect or so badly administer our trust that the Falls of Niagara lose their beauty and their human interest. If we blame the men of a former day for not setting apart when it was the property of the State and might easily have been done, the Falls of Niagara as the (Yosemite) and the Yellowstone have in our day been set apart, then how much more culpable shall we be, who knowing their value and perceiving their certain destruction, still refuse to take the necessary measures for their preservation.

## IX.

In accordance with the suggestion contained in the joint resolution of the Legislature, the Commissioners held a conference with the members of the ministry of the Province of Ontario in September last. This conference disclosed a feeling in Canada which justifies the belief that if New York shall do her part in this work, Canada will do hers.\* To the Canadians it appeared that under the limitations of their governmental system it would be appropriate that the burden of the undertaking should be borne by the Dominion government. It is not necessary to point out the respects which would make it unsuitable for New York to appeal to the Federal government to relieve her from whatever expense the matter may involve. It is sufficient to say that many considerations of State pride as well as of constitutional difficulty, make it clear that if the American part of this work is to be done at all, it must be done by New York alone.

Mr. Gardner and Mr. Olmsted, considering the Legislature to have had in view a reservation upon both sides of the river, examined the Canadian as well as the American shore. Their plans were favorably received by the gentlemen who represented the government of

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\* Since this report was prepared the Legislature of Ontario has taken preliminary action for the purpose.



DISSEMINATED TO  
BATH PLANT IN THE AMERICAN PAPER







Ontario at the conference referred to. The Commissioners are of opinion that if the recommendations of this report shall be accepted by the Legislature, the plan suggested will be adopted by the Canadian government as well.

### X.

Upon the grounds which have been set forth, the Commissioners advise that the Legislature take such action as may be appropriate to acquire the lands described in the accompanying maps, provided the same can be purchased for a reasonable price, and that a Commission be appointed with power to take the necessary legal measures.

Should the Legislature be so disposed, the act for the purpose may be limited to authorize merely the necessary preliminary measures, leaving it for the following Legislature to make the appropriation if it shall see fit to do so, after the awards have been made, and it has thus been determined what the actual cost of the lands will be. This would avoid any danger of involving the State in unforeseen expense.

All of which is respectfully submitted,

W. A. WHEELER,  
ROBT. S. HALE,  
WILLIAM DORSHFIMER,  
FRANCIS A. STOUT,  
GEO. GEDDES,  
F. A. P. BARNARD,

*Commissioners.*







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# REPORT OF THE DIRECTOR.

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## *To the Board of Commissioners of the State Survey :*

Lord Dufferin's proposal that the land about Niagara Falls should be controlled by the governments of Ontario and New York, for the benefit and protection of the public, was at first looked upon rather as an expression of philanthropic sentiment than an earnest proposal of a practical measure. Unsympathetic critics suggested that his kindly nature had been unduly moved by witnessing the tortures of his fellow-beings under persecutions of hackmen, importunities of perambulating photographers, and all the pocket-draining exactions of endless gate-keepers and guides, who combine to make the visitor's life miserable and his stay short in Niagara Falls. When, however, Governor Robinson put the matter so forcibly in his last message to the Legislature, appealing to the pride of the people to protect this great and beautiful gift of nature from being degraded into a show and made the means of exasperating extortion, while the shores, once forest-clad, became mill-sites and places of amusement, the appeal found a response in the feelings of our citizens ; and the Legislature directed the Board of the State Survey to inquire, consider, and report what measures it may be expedient for the State to adopt, to carry out the suggestions contained in the annual message of the Governor, with respect to Niagara Falls.

In accordance with your directions and accompanied by Mr. Frederick Law Olmsted, Landscape Architect, I first visited Niagara Falls on the twenty-eighth of May.

Although sympathizing in the pride which every citizen of the State feels in our possessions in the great cataract, whose wonders

have for two hundred years been better known to Europeans than any other one thing in America ; and feeling that the preservation of its beauties was a matter of personal interest to every New Yorker ; feeling, too, that this scene of nature's grandest effort is a precious inheritance to be handed down to our children unmarred by the destructive hand of the money-maker or the decorations of art, yet I was not convinced that to accomplish this, it would be necessary for the State to assume control of the lands about the Falls. Therefore, with an unprejudiced mind, I was prepared to examine the facts that lay before us.

Four principal elements combine to make Niagara what it is : the Rapids ; the picturesque islands around which they rush ; the Falls themselves, and the deep chasm below. A mile above the Falls, the river is spread out broad and calm and placid as a lake. At the upper end of Goat Island, the smooth surface breaks suddenly into furious rapids, whose wild, white-crested waves, hurrying with ceaseless roar to the inevitable brink, are almost as impressive as the Falls themselves. In the midst of this scene of turmoil and irresistible rush of waters stands Goat Island, with fifteen smaller islands and islets about it. Goat Island is more than half a mile long by a quarter of a mile broad. The surrounding islets vary from 400 feet to ten feet in diameter. On all of these, except Bath Island, the hand of man has spared the primeval forest. Picturesque clusters of evergreens, rising out of dashing waters, the rich, overhanging foliage of the high banks of Goat Island and deep seclusion of its woods, give to this spot a charm not shared by any other about Niagara. The views of the American and Horseshoe Falls, seen from the west end of the island, are far more impressive, sink deeper into the mind than any others, because only here the visitor finds himself surrounded by the influences of nature.

Half way between Goat Island and the American side of the river is Bath Island, whose position in the middle of these rapids must have made it a fascinating place in early days. In an evil hour it entered into some man's mind to start a paper mill there—small at first, but extending year by year, till in place of graceful woods, the ground is covered with unsightly sheds and buildings, and the Rapids above are disfigured with wing-dams and ice barriers ; the whole group forming a shocking contrast to the natural scenery.

This paper mill is, however, only one among the many abominations which mar the beauty of the American Rapids. Their eastern



THE LEHIGH VALLEY MILLS, LEHIGH VALLEY, PA.





bank was once rich in verdure and overhung with stately trees. In place of the pebbly shore, the graceful ferns and trailing vines of former days, one now sees a blank stone wall with sewer-like openings through which tail races discharge ; some timber crib work bearing in capitals a foot high the inscription, " Parker's Hair Balsam ; " then further up stream, more walls and wing dams. Overlooking this disfigured river brink, stands an unsightly rank of buildings in all stages of preservation and decay ; small " hotels," mills, carpenter shops, stables, " bazaars," ice-houses, laundries with clothes hanging out to dry, bath houses, large, glaring white hotels, and an indescribable assortment of miscellaneous rookeries, fences, and patent medicine signs, which add an element of ruin and confusion to the impression of solid ugliness given by the better class of buildings. And all this is the back ground to one of the grandest spectacles in the world, the rapids of a mighty torrent writhing and foaming in the fury of its downward rush. Is it any wonder that visitors do not desire to remain long in the presence of such discords, but, when the first feeling of curiosity is satisfied, hasten away ? In looking at the Falls from Goat Island or the Canada side, one cannot help seeing these rows of buildings which line the village shore of the river. Only one spot invites the eye to rest on its green trees. This is Prospect Park at the east end of the American Falls. But even here, the hand of the progressive owner has torn away the shrubs and rich masses of woodbine that clustered along the edge of the precipice, and in their places are seen walls and structures supposed to be for the safety and entertainment of travelers.

The Falls themselves man cannot touch ; but he is fast destroying their beautiful frame of foliage, and throwing around them an artificial setting of manufactories and bazaars that rouse in the intelligent visitor deep feelings of regret and even of resentment.

The chasm below the Cataract depends for its impressiveness largely upon the wooded character of the debris slopes and the maintaining of a fringe of verdure along the very brink of the precipice. Here, too, those elements which are essential to the perfection of the landscape are rapidly disappearing. Two mills and a brewery, all built within a short time, near the bank about half a mile below the Falls, warn us of what is coming.

From this sketch of the existing state of the surroundings of Niagara, it will be seen that little remains of their original beauty, except on Goat Island, where the primitive forest still stands as it did

in the days of Father Hennepin's first visit to the great Cataract in 1679. The Island has been carefully preserved from "improvement" by the owners (the Porter family), but it will probably soon pass from their hands, owing to a partition suit now in progress. I made careful inquiry concerning the nature of the proposals for purchase which have been made, to ascertain what will be the probable fate of the Island when it is sold. By some it has been proposed to cut the woods off the Island, and make a race-course of it; others think it a favorable sight for a great summer hotel; others wish to make a rifle range upon it, while another and more practical party suggest cutting a canal down the centre of the island and building a row of factories along its front between the American and Canadian Falls. All these, and other schemes that I heard of in connection with the sale of the Island, contemplate the destruction of this one remaining piece of native forest.

I became fully convinced that within a short time, unless the State buys Goat Island, it will be sold to some one who, in order to secure from his investment a good return, will make the Island a place of amusement or of manufacturing. No power but that of the State can save this delightful spot from the fate which has overtaken all other pieces of forest around the Falls.

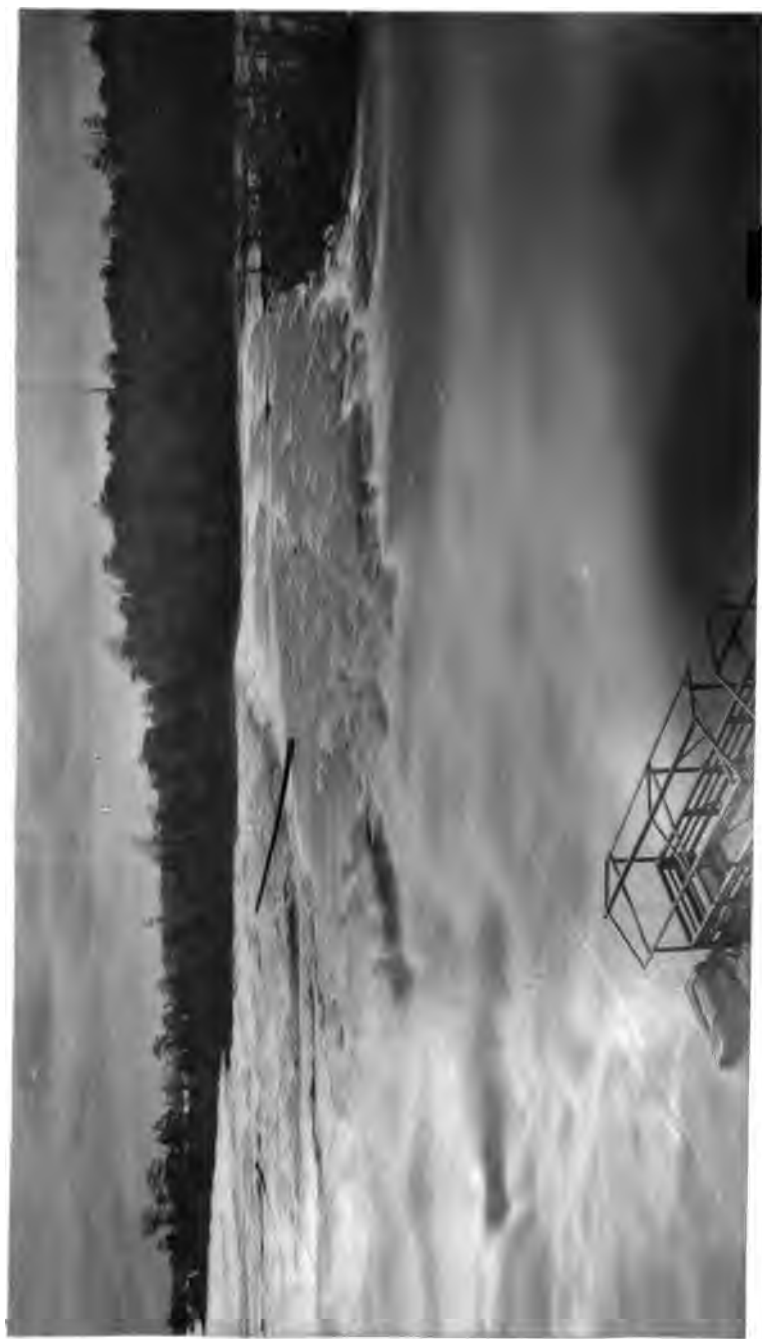
It remains, then, for us to consider what could be done, by State intervention, to restore to all the river shores something of their original character.

It is now a clearly recognized duty of governments to reserve from sale parts of the public domain that contain natural features of such unusual character as to be objects of interest to the whole world, and whose perfection may be seriously marred by private ownership. Free enjoyment of these noblest works of nature is now felt to be one of man's most precious privileges, not to be abridged by private rights or greed for gain. Acting on this principle the general government in 1865 dispossessed settlers in the Yosemite valley, and reserved it for the benefit of the public. A great tract covering the region of the Yellowstone Geysers has also been designated as a National Park, and now the land occupied by the California Big Trees is dedicated to public use. The State of New York also has taken a similar position respecting the beautiful Islands of Lake George.

A hundred years ago the land along Niagara River belonged to the State. Every one realizes that it never should have been sold; but all the islands and a belt at least a quarter of a mile broad and five



STATE OF MICH.  
DEPT. OF NATURAL RESOURCES  
BUREAU OF FISHERIES  
FISH AND GAME DIVISION  
ANN ARBOR, MICH.





miles long should have been kept for public use. The error made by the State in parting with this territory will never be fully repaired. Much of the harm done is irretrievable, but much can even yet be accomplished at a reasonable expense to restore the lost attractions.

Goat Island, preserved hitherto by the kindly care of the Porters, may still be rescued from becoming either a mill site or a circus; the structures may be swept from Bath Island and the Rapids, and the spot restored by planting to its former beauty; on the main shore by the removal of seven good buildings and ten of little value, the river front of Niagara Village may be cleared from Port Day to upper suspension bridge, giving a belt of public land a mile long and widening from 100 feet at the head of the Rapids to 800 feet broad at the Falls, where most room is needed for visitors.

By planting this strip of land with trees the whole village may be shut out from view—"planted out"—and the unsightly walls, the sewer mouths and wing dams replaced by natural banks like those of Goat Island.

To make an effectual screen of trees between the river and the village it is necessary to plant the top of the terrace which is approximately followed by the line of Canal street.

After careful study of the ground, Mr. Olmsted and I are of opinion that from the suspension bridge to the head of the Rapids the east side of Canal street should be the boundary of the State reservation, and that any narrower belt along this part of the river will not answer the desired purposes. The number of acres to be purchased would be about 77: Prospect Park and the lots east of it would be included. From the Rapids up to Port Day, River street runs along the water's edge. The street is so broad, (from 60 to 100 feet,) that room is given for both roadway and trees. Control of the street should be assumed by the State, and it should be planted, and protected in connection with the lands opposite the Rapids. To realize the total change that the carrying out of this plan would make in the aspects of Niagara, those who are not familiar with the scene may compare the accompanying photographs of the village shore with the picture of the same ground as it will appear when restored, according to our plan.

We recommend also that the State acquire title to the debris-slopes under the cliff from the American Falls to the railroad suspension bridge for the purpose of preserving and restoring the woods that

border this part of the river. As the land is worthless for building, it can doubtless be obtained for little or nothing.

We recommend also that the right be secured to plant and maintain a narrow belt of trees with a walk at least a mile in length along the edge of the cliff below the suspension bridge. This planted belt need not be over twenty-five or thirty feet broad. Its trees will clothe the barren nakedness of the cliff edge and partially screen out mills and unsightly structures from the river views, and at the same time afford shade to visitors enjoying the profound impressions of this part of the chasm. The State need not buy the land but only secure a right to plant and preserve. The property belongs to the Hydraulic Power and Canal Company, and is to be used for mills. The walls of these mills will be set back from the cliff, their wheel pits only being sunk at the edge of the precipice. There will be few of these pits, and they can be easily bridged for the proposed walk. The president of the Company owning this property has assured us that he will willingly cede the desired right to the State.

By referring to the accompanying Property Map of Niagara Falls Village, it will be seen that a number of streets are included in the proposed reservation. The State has full power to take possession of those where they have been accepted and belong to the village. One of these public streets, Water street, has been fenced up and made to appear as part of Prospect Park, but it is clearly the right of the village or the State to re-open it, as in 1853 and 1868, it was in due form accepted by the village (see Proceedings of Village Trustees, Vol. I, pages 260-265 ; Vol. III, pages 177, 178, 180 and 181), and after a legal trial was, in 1874, specially decided by Judge Daniels to be a public highway.

I made a very careful investigation into the value of the property covered by our plan, and had the principal buildings, which would be removed, appraised by a most experienced builder, who went from Albany for that purpose. The results are before your Board, but it is evidently impossible for me to estimate what the property will cost the State when the price to be paid for land condemned under the right of eminent domain must be fixed by a commission.

It is, however, to be hoped that the great value to the locality of the proposed reservation will be so evident to all that reasonable prices will be asked, and that a project which should appeal to the pride of every citizen may not be degraded in public estimation by being made a means of private gain.





OF NIAGARA  
T. GARDNER

AND



In a spirit of patriotism what remains of Niagara's beauty should be preserved; what is lost should be restored. Only the power of the State can accomplish this.

And now more than ever, the great Cataract is the property of the whole people. A visit to the Falls is no longer the luxury of the rich. Excursion rates on the railways have made it possible for the humblest citizens to see Niagara, and more than 100,000 visitors came this season. The heavy local exactions fall most oppressively on the poor, but to the wealthy they are simply annoying. While, therefore, the plan of a State reservation appeals to the taste and æsthetic comfort of the rich, it also promises relief to the pocket of the poorer citizen, wishing to enjoy his rights in our common inheritance.

The maps accompanying this report show the plan of the property which Mr. Olmsted and I recommend to be taken by the State and reserved for public use. The illustrations exhibit the present aspects of the neighborhood of the Falls, and an ideal view of the American Falls and Rapids as they will appear if the restoration is carried out. Although truthful in the general impression conveyed, such a view cannot, of course, be accurate in detail.

I have appended to the report a fac-simile of the first printed description of Niagara Falls by an eye witness and the first picture of them; both taken from the first edition of Father Hennepin's narrative. It is interesting to consider that many of the trees standing now on Goat Island looked down on this first recorded visit of a white man to the Falls, and have remained the only living witnesses of those important scenes in the dramas of European conquest in America which were enacted at this all-important portage in the great water route to the heart of the continent. The savage chiefs and conquering generals, the tribes and armies that moved along this well-known track from Ontario and launched their vessels on the river above Goat Island, are gone, but the trees that shadowed the flashing stream still remain to make the past real and bring vividly to memory our wonderful progress.

Is it wise to allow the destruction of these living monuments of history? Will not posterity justly scorn a generation which permits them to be cut down to make way for a race-course or a parade-ground?

While the great trees of Goat Island have stood fast through the centuries since Hennepin's visit in 1679, the Falls themselves have greatly changed, receding as the rocks are worn away by the water.

Exactly where the Falls stood two hundred years ago we do not know. Their position at different periods may, to a certain extent, be conjectured by what we know of the recession during the thirty-three years from 1842 to 1875. Owing to the foresight of Prof. James Hall, a trigonometrical survey of Niagara was made in 1842, and the resulting map accompanied his report to the State. I have had the map reproduced, and drawn on it in red the position of the brink of the Falls in 1875, according to the triangulation of the United States Lake Survey. This map which accompanies my report, shows the unexpected fact that the Horseshoe Falls have receded in places 160 feet during thirty-three years, and that a large island has disappeared which formerly existed in the midst of the Canadian Rapids. These remarkable physical changes are of deep interest, and their progress should be watched and recorded with great care. The conclusions to be attained by accurate geological study of the region open almost limitless views into far-reaching vistas of the continent's physical history.

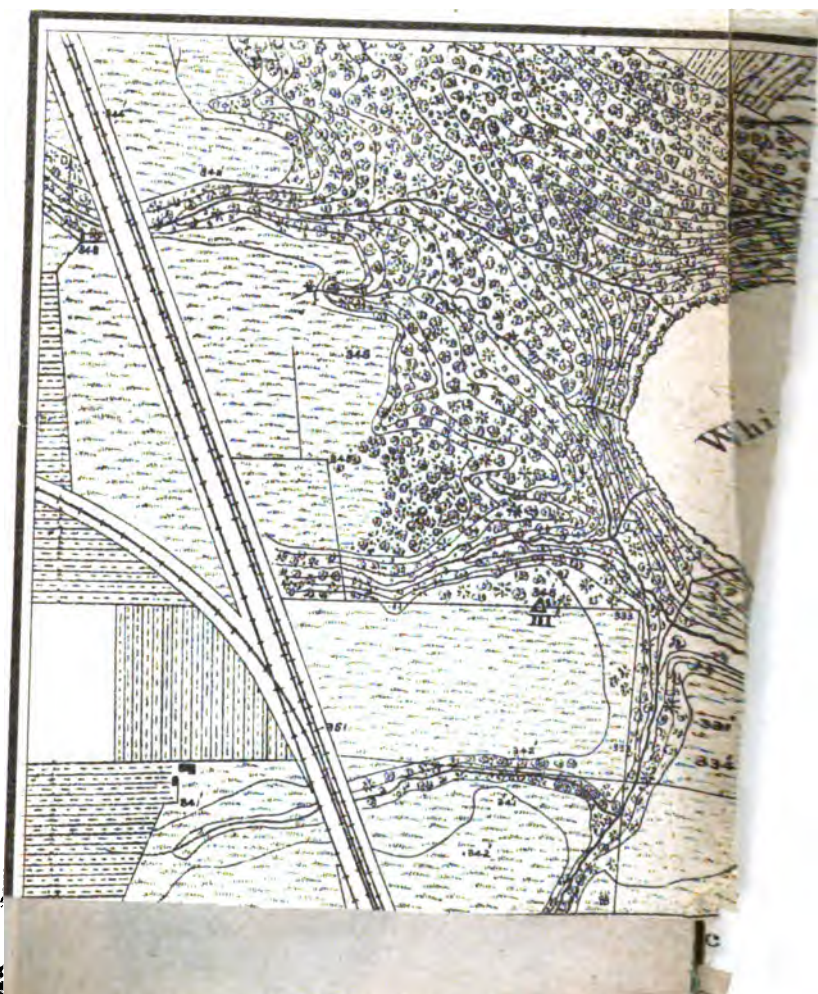
Whether, then, we consider Niagara in the light of its glorious scenery, swaying the imagination of the world and drawing to its shrine more visitors than any other of nature's works, or whether we regard its associations with American history and the deep lessons that it can teach of earth's changes through working of great natural forces: in either view it is wonderful, it is unparalleled, it is priceless. But we find its treasures in the grasp of money-getters, and its sacred groves assailed by the axe of the mill-man or desecrated by the purveyor of public amusements; and are convinced that destruction of the scenery will be swift and certain unless the all-powerful State shall appear as the preserver of Niagara.

Very respectfully submitted,

JAMES T. GARDNER,

*Director,*

*New York State Survey.*



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## NOTES BY MR. OLMSTED.

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The few notes which I propose to append to Mr. Gardner's report will be directed to a single point.

There are those, and I fear that most of the people of Niagara are among them, to whom it appears that the waterfall has so supreme an interest to the public that what happens to the adjoining scenery is of trifling consequence. Were all the trees cut away, quarries opened in the ledges, the banks packed with hotels and factories, and every chance-open space occupied by a circus tent, the Falls would still, these think, draw the world to them. Whatever has been done to the injury of the scenery has been done, say they, with the motive of profit, and the profit realized is the public's verdict of acquittal.

It must be considered, therefore, that the public has not had the case fairly before it.

The great body of visitors to Niagara come as strangers. Their movements are necessarily controlled by the arrangements made for them. They take what is offered, and pay what is required with little exercise of choice. The fact that they accept the arrangements is no evidence of their approval.

*The real question is, how, in the long run, is the general experience of visitors affected by measures and courses which are determined with no regard to the influence of the scenery?*

I have myself been an occasional visitor at Niagara for forty-five years. My attention was first called to the rapidly approaching ruin of its characteristic scenery by Mr. F. E. Church, about ten years ago. Shortly afterwards, several gentlemen, frequenters of the Falls, met at my request, to consider this danger, one of them being a member of the Commission now reporting on the subject. I have thus had both occasion and opportunity for observing the changed courses into which the public has been gradually led and of studying these courses and their results.

When the arrangements by which visitors were conducted were yet

simple; when there were few carriages, and these little used; when a visit to the Falls was a series of expeditions, and in each expedition hours were occupied in wandering slowly among the trees, going from place to place, with many intervals of rest, there was not only a much greater degree of enjoyment, there was a different kind of enjoyment from any now generally obtained. People then were loth to leave the place; many lingered on from day to day after they had prepared to go, revisiting ground they had gone over before, turning and returning; and when they went away it was with grateful hearts and grateful words.

The change from this to what is described in the second section of the Commissioners' report has been gradual and, while something must be attributed to modern ease of travel, a greater influx of visitors and to habits of quicker movement and greater restlessness; much must also be referred to the fact that visitors are so much more constrained to be guided and instructed, to be led and stopped, to be "put through," and so little left to natural and healthy individual intuitions.

The aim to make money by the showman's methods; the idea that Niagara is a spectacular and sensational exhibition, of which rope-walking, diving, brass bands, fire-works and various "side-shows" are appropriate accompaniments, is so presented to the visitor that he is forced to yield to it, and see and feel little else than that prescribed to him.

But all the time there are some who, because of better information and opportunities, and as the result of previous training, get the better of this difficulty, and to these the old charm remains. Take as an illustration, the experience of the writer of the following passage. It is that of a man who has traveled extensively for the express purpose of observing scenery and comparing the value, as determined by the influence on the imagination, of different types of scenery. It is recorded in a little book which treats more especially of the scenery of the Alps and of what are designated "nature's gardens" among them.\* But says the author:

"The noblest of nature's gardens that I have yet seen is that of the surroundings and neighborhood of the Falls of Niagara. Grand as are the colossal Falls, the Rapids and the course of the river for a considerable distance above and below possess more interest and beauty.

"As the river courses far below the Falls, confined between vast walls of rock—the clear water of a peculiar light-greenish hue, and white here and there with circlets of yet unsoothed foam—the effect is startlingly beautiful, quite apart from the Falls. The high cliffs are crested with woods; the ruins of the great rock walls forming wide, irregular banks between them and the water, are also beautifully clothed with wood to the river's edge, often so far below that you sometimes look from

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\*Alpine Flowers, by William Robinson, F. L. S. London: John Murray, 1875.





IN THE WOODS OF GOAT ISLAND.



Saying nothing of the infinitely varied beauties of water and spray, and of water-worn rock, I will, for a purpose, mention a few elements which contribute to this distinctive charm.

The eminent English botanist, Sir Joseph Hooker, has said that he found upon Goat Island a greater variety of vegetation within a given space than anywhere in Europe, or east of the Sierras, in America; and the first of American botanists, Dr. Asa Gray, has repeated the statement. I have followed the Apalachian chain almost from end to end, and traveled on horseback, "in search of the picturesque," over four thousand miles of the most promising parts of the continent without finding elsewhere the same quality of forest beauty which was once abundant about the Falls, and which is still to be observed in those parts of Goat Island where the original growth of trees and shrubs has not been disturbed, and where, from caving banks, trees are not now exposed to excessive dryness at the root.

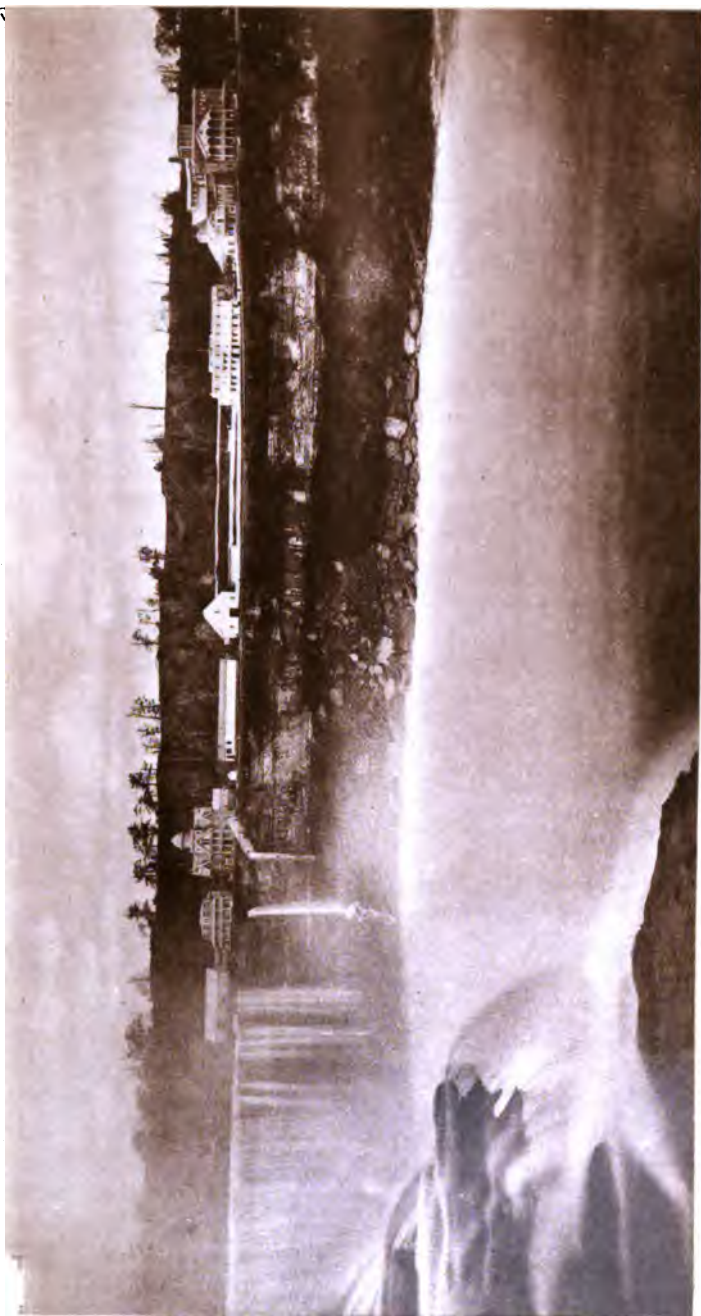
Nor have I found anywhere else such tender effects of foliage as were once to be seen in the drapery hanging down the wall of rock on the American shore below the Fall, and rolling up the slope below it, or with that still to be seen in a favorable season and under favorable lights, on the Canadian steeps and crags between the Falls and the ferry.

All these distinctive qualities,—the great variety of the indigenous perennials and annuals, the rare beauty of the old woods, and the exceeding loveliness of the rock foliage,—I believe to be a direct effect of the Falls, and as much a part of its majesty as the mist-cloud and the rainbow.

They are all, as it appears to me, to be explained by the circumstance that at two periods of the year when the northern American forest elsewhere is liable to suffer actual constitutional depressions, that of Niagara is insured against like ills, and thus retains youthful luxuriance to an unusual age.

First, the masses of ice, which, every winter are piled to a great height below the Falls, and the great rushing body of ice-cold water coming from the northern lakes in the spring, prevent at Niagara the hardship under which trees elsewhere often suffer through sudden checks to premature growth; and, second, when droughts elsewhere occur, as they do, every few years, of such severity that trees in full foliage droop and dwindle, and even sometimes cast their leaves, the atmosphere at Niagara is more or less moistened by the constantly evaporating spray of the Falls, and in certain situations frequently bathed by drifting clouds of mist.

Something of the beauty of the hanging foliage below the Falls is also probably due to the fact, that the effect of the frozen spray upon it is equivalent to the horticultural process of "shortening in;" compelling a denser and closer growth than is, under other circumstances, natural.



THE GREAT FALLS  
BRIDGE OF THE GREAT FALLS AND CANADIAN RAILWAY.



Reference is made at page 9, of the Commissioners' report to a marvelous effect in scenery above the Falls. It is that to which the following account by the Duke of Argyle applies:

"The River Niagara, above the Falls, runs in a channel very broad, and very little depressed below the general level of the country. But there is a steep declivity in the bed of the stream for a considerable distance above the precipice, and this constitutes what are called the Rapids. The consequence is that when we stand at any point near the edge of the Falls, and look up the course of the stream, the foaming waters of the Rapids constitute the sky line. No indication of land is visible — nothing to express the fact that we are looking at a river. The crests of the breakers, the leaping and the rushing of the waters, are still seen against the clouds, as they are seen in the ocean, when the ship from which we look is in the trough of the sea. It is impossible to resist the effect on the imagination. It is as if the fountains of the great deep were being broken up, and that a new deluge were coming on the world. The impression is rather increased than diminished, by the perspective of the low wooded banks on either shore, running down to a vanishing point and seeming to be lost in the advancing waters. An apparently shoreless sea tumbling toward one is a very grand and a very awful sight. Forgetting, then, what one knows, and giving oneself to what one only sees, I do not know that there is anything in nature more majestic than the *view of the Rapids* above the Falls of Niagara."

FREDERICK LAW OLMSTED.



# MEMORIAL

ADDRESSED TO .

## THE GOVERNOR OF NEW YORK, AND THE GOVERNOR-GENERAL OF CANADA.

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To ALONZO B. CORNELL, *Governor of the State of New York* :

The undersigned, citizens of several states and countries, address you by reason of the suggestion lately made by LORD DUFFERIN, that the State of New York and the Dominion of Canada should secure and hold, for the world's good, the lands adjacent to the Falls of Niagara.

The Falls of Niagara are peculiarly exposed to disastrous injury. The heights of snow, the precipitous crags of great mountains, however they may be disfigured by man, can rarely be applied to uses which would destroy their sublimity. But should the islands and declivities of the Niagara River be stripped of their natural woods, and occupied for manufacturing and business purposes; should even the position, size, and form of the constructions which the accommodation of visitors will call for, continue to be regulated solely by the pecuniary interests of numerous individual land-owners, the loss to the world will be great and irreparable. The danger may be measured by what has already occurred. The river's banks are denuded of the noble forest by which they were originally covered; are degraded by incongruous and unworthy structures, made for advertising purposes, willfully conspicuous and obtrusive, and the visitor's attention is diverted from scenes to the influence of which he would gladly surrender himself, by demands for tolls and fees, and the offer of services most of which he would prefer to avoid.

Objects of great natural beauty and grandeur are among the most valuable gifts which Providence has bestowed upon our race. The contemplation of them elevates and informs the human understanding. They are instruments of education. They conduce to the order of society. They address sentiments which are universal. They draw together men of all races, and thus contribute to the union and the peace of nations.

The suggestion, therefore, that an object of this class so unparalleled as the Falls of Niagara should be placed under the joint guardianship of the two governments whose chief magistrates we have the honor to address, is a proper concern of the civilized world, and we respectfully ask that it may, by appropriate methods, be commended to the wise consideration of the Legislature of New York.

A similar memorial has been addressed to the Governor-General of Canada.

W. A. WHEELER,  
Vice-President of the United States.

ALEX. RAMSEY,  
Secretary of War of the United States.

M. R. WAITE,  
Chief Justice United States Supreme Court.

NATHAN CLIFFORD,  
Associate Justice United States Supreme Court.

N. M. SWAYNE,  
Associate Justice United States Supreme Court.

STEPHEN J. FIELD,  
Associate Justice United States Supreme Court.

JOSEPH P. BRADLEY,  
Associate Justice United States Supreme Court.

JOHN M. HARLAN,  
Associate Justice United States Supreme Court.

W. STRONG,  
Associate Justice United States Supreme Court.

SAM. F. MILLER,  
Associate Justice United States Supreme Court.

A. A. DORION,  
Chief Justice Court of Appeals, Canada.

S. C. MONK,  
Judge Queen's Bench.

A. E. BURNSIDE,  
United States Senate,

- J. G. BLAINE,  
United States Senate.
- JUSTIN S. MORRILL,  
United States Senate.
- H. B. ANTHONY,  
United States Senate.
- J. D. CAMERON,  
United States Senate.
- W. B. ALLISON,  
United States Senate.
- MAT. H. CARPENTER,  
United States Senate.
- JOHN JAMES INGALLS,  
United States Senate.
- DAVID D. PORTER,  
Admiral United States Navy.
- GEORGE C. BRODRICK,  
Member Parliament.
- M. E. GRANT DUFF,  
Member Parliament.
- R. W. HANBURY,  
Member Parliament.
- W. R. GREG,  
Member Parliament.
- F. MAX MÜLLER,  
University of Oxford.
- B. JOWETT,  
University of Oxford.
- HENRY J. SMITH,  
University of Oxford.
- CLARENCE KING,  
Director United States Geological Survey.
- JOHN,  
Cardinal, Archbishop of New York.
- S. B. CHITTENDEN,  
Member Congress.
- S. S. COX,  
Member Congress.
- W. D. KELLEY,  
Member Congress.
- D. G. JOHNSON,  
Judge Superior Court, Canada.



- R. MACKAY,**  
Judge Superior Court, Canada.
- F. W. TORRENCE,**  
Judge Superior Court, Canada.
- WM. B. MONTREAL,**  
Lord Bishop.
- S. RIVARD,**  
Mayor of Montreal.
- S. S. HUNTINGDON,**  
Member Parliament.
- M. H. GAULT,**  
Member Parliament.
- THOMAS W. RITCHIE,**  
Member Parliament.
- J. W. DAWSON,**  
Principal McGill College, Montreal.
- P. A. PETERSEN,**  
Chief Engineer, Government of Quebec.
- CHARLES W. ELIOT,**  
President Harvard University.
- BENJ. H. PADDOCK,**  
Bishop of Massachusetts.
- THOMAS M. CLARK,**  
Bishop of Rhode Island.
- JAMES MCCOSH,**  
President College of New Jersey.
- CHARLES B. ANDREWS,**  
Governor of Connecticut.
- NOAH PORTER,**  
President Yale College.
- J. WILLIAMS,**  
Bishop of Connecticut.
- NATT. HEAD,**  
Governor of New Hampshire.
- A. B. THOMPSON,**  
Secretary of State of New Hampshire.
- WILLIAM WOODRUFF NILES,**  
Bishop of New Hampshire.
- HENRY A. COIT, D.D.,**  
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- HOWARD CROSBY,**  
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- ALEX. S. WEBB,**  
President College of the City of New York.
- D. HUNTINGTON,**  
President National Academy of Design.
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National Academy.
- SANFORD R. GIFFORD,**  
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- A. BIERSTADT,**  
National Academy.
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United States Army.
- ALBERT J. MYER,**  
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- J. Q. A. WARD,**  
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HUGH ALLEN.	MORGAN DIX.
FRANCIS HINCKS.	CHARLES A. DANA.
THOMAS CARLYLE.	SAMUEL OSGOOD.
JOHN RUSKIN.	WILLIAM HENRY HURLBUT.
LESLIE STEPHEN.	JAMES M. BROWN.
FREDERICK HARRISON.	HOWARD POTTER.
R. WALDO EMERSON.	JOHN CROSBY BROWN.
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JOHN G. PALFREY.	WM. D. KELLEY.
FRANCIS PARKMAN.	HENRY C. POTTER.
OLIVER WENDELL HOLMES.	JOHN LA FARGE.
ASA GRAY.	RAPHAEL PUMPELLY.
ALEX. AGASSIZ.	HENRY G. MARQUAND.
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CHARLES ELIOT NORTON.	S. P. AVERY.
F. J. CHILD.	JOHN JAY CISCO.
HORATIO SEYMOUR.	S. P. DI CESNOLA.
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THURLOW WEED.	DANL. S. APPLETON.
JOHN JAY.	W. D. MORGAN.
GEO. W. SCHUYLER.	ROBT. B. MINTURN.
CHARLES FRANCIS ADAMS.	W. E. DODGE, JR.
MARTIN BRIMMER.	LLOYD ASPINWALL, JR.

EDWARD C. POTTER.  
NEWBOLD LE ROY.  
CHAS. RUSSELL HONE.  
JAMES P. LOWREY.  
GEORGE BELL.  
THEODORE WESTON.  
HENRY D. SEDGWICK.  
F. F. MARBURY.  
G. N. STOUGHTON.  
WILLIAM DORSHEIMER.  
DAVID DUDLEY FIELD.  
ROYAL PHELPS.  
JOHN A. STEWART.  
E. D. MORGAN, JR.  
BENJ. B. THURMAN.  
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LEONARD W. JEROME.  
PAUL FORBES.  
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J. H. PINCKNEY.  
GEO. E. WARING.  
G. E. HUNTINGTON.  
S. H. WALES.  
SINCLAIR TOUSEY.  
GEO. HAVEN PUTNAM.  
WM. E. CURTIS.  
HENRY R. WINTHROP.  
A. R. MACDONOUGH.  
CHARLES C. HAIGHT.  
PH. SCHUYLER.  
F. O. C. DARLEY.  
SMITH, E. LANE.  
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DOUGLASS CAMPBELL.  
W. H. BEARD.

SAML. D. BABCOCK.  
HERMAN R. LE ROY.  
J. H. DRAPER.  
WM. B. RICE.  
S. NICHOLSON KANE.  
F. SHELDON.  
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WM. H. SEWARD.  
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JOSIAH LETCHWORTH.  
R. B. WELCH.  
CHARLES C. DWIGHT.  
C. D. MACDOUGALL.  
DENNIS R. ALWARD.  
BYRON C. SMITH.  
CHAS. HAWLEY.  
G. W. CLINTON.  
SHERMAN S. ROGERS.  
E. C. SPRAGUE.  
WM. F. ROGERS.  
S. S. JEWETT.  
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PETER REDPATH.  
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WOLFENSTON THOMAS.  
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W. J. PATTERSON.  
J. R. GILLIS.  
THOS. DAVIDSON.  
D. L. MCDUGALL.  
S. J. EWING.

W. A. MERRY.  
 THOS. LYMAN.  
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 JAMES DAKERS.  
 JOHN H. R. MOLSON.  
 JAMES F. D. BLACK.  
 MAURICE S. BALDWIN.  
 JAMES A. MCLEOD.  
 JOHN CRAWFORD.  
 ANDREW ROBERTSON.  
 EDWARD SULLIVAN.  
 O. C. EDWARDS.  
 JOHN FLETCHER.  
 A. C. DE LOTBINIERE HARWOOD.  
 R. W. GRAHAM.  
 R. N. GRANT.  
 CHARLES SMITHERS.  
 W. J. BUCHANAN.  
 FRED. NASH.  
 WM. DARLING.  
 HENRY LYMAN.  
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JOHN KENNEDY.  
 RICHARD HOLLAND.  
 J. FAIRBAIRN.  
 DAVID R. McCORD.  
 H. A. NELSON.  
 J. H. MOONEY.  
 CH. D. PROCTOR.  
 S. ST. ONGE.  
 GUIL. LA MOTHE.  
 JOS. PIERRE LE BEL.  
 A. B. STEWART.  
 J. G. DINNING.  
 W. W. STUART.  
 JAMES FOLEY.  
 A. MURRAY.  
 PHILIP HOLLAND.  
 JAMES MITCHELL.  
 W. B. COURT.  
 EDW. CHAPIN.  
 J. M. BUCKNELL.  
 R. T. ROUTH.  
 JNO. F. ROSS.  
 JOHN TORRANCE.  
 GEORGE A. DRUMMOND.

And 400 other citizens of Canada and the United States.

*2d March, 1880.*

Rich.  
198:456:

A  
**New Discovery**  
OF A  
*Vast Country in AMERICA,*  
Extending above Four Thousand Miles,  
BETWEEN  
New France *and* New Mexico.

WITH A  
Description of the Great *Lakes, Cata-*  
*racts, Rivers, Plants, and Animals:*

Also, The *Manners, Customs, and Languages*, of the  
several Native *Indians*; And the Advantage of  
Commerce with those different Nations.

WITH A  
**CONTINUATION:**

Giving an ACCOUNT of the  
Attempts of the *Sieur De la SALLE* upon the  
Mines of *Sr. Barbe*, &c. The Taking of  
*Quebec* by the *English*; With the Advantages  
of a Shorter Cut to *China* and *Japan*.

Both Parts Illustrated with *Maps* and *Figures*,  
and Dedicated to His Majesty *K. William*.

By *L. Hennepin*, now Resident in *Holland*.

To which is added, Several New Discoveries in *North-*  
*America*, not publish'd in the *French Edition*.

L O N D O N: Printed for *M. Bentley, J. Telfer, H. Bow-*  
*wick, T. Goodwin, and S. Manship.* 1 6 9 8.

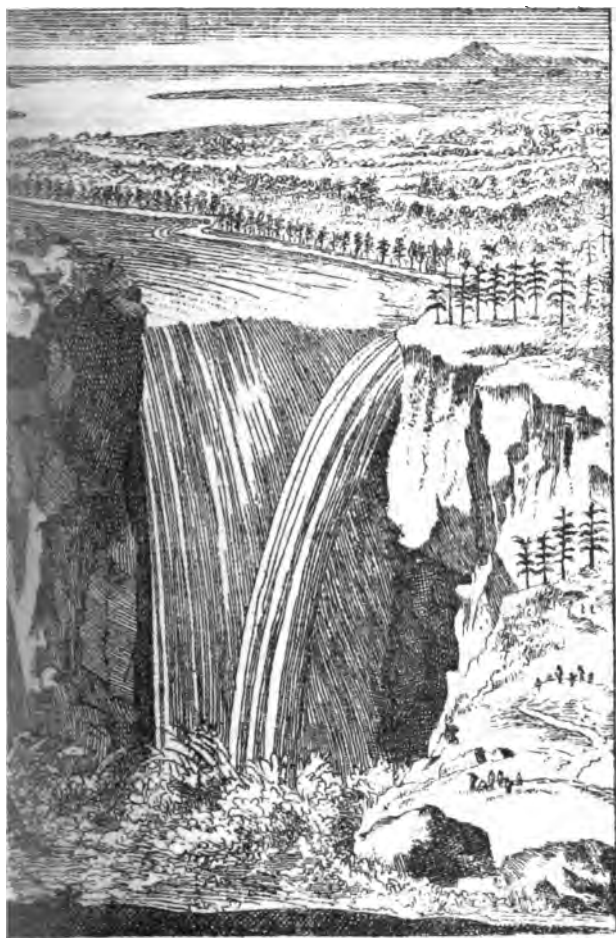








*Fig. 29*





## *a Large Country in America.* 29

in Winter it is more difficult, because of the outrageous Winds which abound there. From this Lake one may go by Barks, or by greater Vessels to the foot of a great Rock that is about two Leagues off the Fall of the River *Niagara*, which I am now to describe.

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### C H A P. VII.

*A Description of the Fall of the River Niagara, which is to be seen betwixt the Lake Ontario and that of Erië.*

**B**ETWIXT the Lake *Ontario* and *Erië*, there is a vast and prodigious Cadence of Water which falls down after a surprizing and astonishing manner, inso much that the Universe does not afford its Parallel. 'Tis true, *Italy* and *Suedeland* boast of some such Things; but we may well say they are but sorry Patterns, when compar'd to this of which we now speak. At the foot of this horrible Precipice, we meet with the River *Niagara*, which is not above a quarter of a League broad, but is wonderfully deep in some places. It is so rapid above this Descent, that it violently hurries down the wild Beasts while endeavouring to pass it to feed on the other side, they not being able to withstand the force of its Current, which inevitably casts them headlong above Six hundred foot high.

This wonderful Downfal, is compounded of two great Cross-streams of Water, and  
two

two Falls, with an Isle sloping along the middle of it. The Waters which fall from this horrible Precipice, do foam and boyl after the most hideous manner imaginable, making an outrageous Noise, more terrible than that of Thunder; for when the Wind blows out of the South, their dismal roaring may be heard more than Fifteen Leagues off.

The River *Niagara* having thrown it self down this incredible Precepice, continues its impetuous course for two Leagues together, to the great Rock above-mention'd, with an inexpressible rapidity: But having past that, its impetuosity relents, gliding along more gently for other two Leagues, till it arrive at the Lake *Ontario* or *Frontenac*.

Any Bark or greater Vessel may pass from the Fort to the foot of this huge Rock above-mention'd. This Rock lies to the Westward, and is cut off from the Land by the River *Niagara*, about two Leagues farther down than the great Fall; for which two Leagues the People are oblig'd to transport their Goods over-land; but the way is very good; and the Trees are but few, chiefly Firrs and Oaks.

From the great Fall unto this Rock which is to the West of the River, the two Brinks of it are so prodigious high, that it would make one tremble to look steadily upon the Water, rolling along with a rapidity not to be imagin'd. Were it not for this vast Cataract, which interrupts Navigation, they might sail with Barks or greater Vessels,  
more

### a Large Country in America. 31

more than Four hundred and fifty Leagues, crossing the Lake of *Hurons*, and reaching even to the farther end of the Lake *Illinois*; which two Lakes we may easily say are little Seas of fresh Water.

Sieur *de la Salle* had a design to have built a Fort at the mouth of the River *Niagara*; and might easily have compass'd it, had he known how to keep himself within bounds, and to have confin'd himself there for one Year. His design was to curb and keep under the *Iroquois*, and especially the *Tschemontouans*, who are the most numerous People, and the most given to War of all that Nation. In fine, such a Fort as this might easily have interrupted the Commerce betwixt these People and the *English* and *Dutch* in *New-York*. Their custom is to carry to *New-York* the Skins of Elks, Beavers, and several sorts of Beasts, which they hunt and seek after some 2 or 300 Leagues from their own home. Now they being oblig'd to pass and repass near to this mouth of the River *Niagara*, we might easily stop them by fair means in time of Peace, or by open force in time of War; and thus oblige them to turn their Commerce upon *Canada*.

But having remark'd that the *Iroquois* were push'd on to stop the execution of this Design, not so much by the *English* and *Dutch*, as by the Inhabitants of *Canada*, who for a great part endeavour'd by all means to traverse this our Discovery; they contented themselves to build a House at the mouth of the River to the Eastward, where the Place was naturally

### 32. *A New Discovery of*

rally fortifi'd. To one side of this House there is a very good Haven, where Ships may safely ride; nay, by help of a Capstane, they may easily be hall'd upon Land. Besides, at this Place they take an infinite quantity of white Fish, Sturgeons, and all other sorts of Fishes, which are incomparably good and sweet; insomuch that in the proper Season of Fishing, they might furnish the greatest City in *Europe* with plenty of Fish.

## C H A P. VIII.

### *A Description of the Lake Erie.*

**T**He *Iroquois* give to this Lake the Name of *Erie Tejocharentiong*, which extends it self from East to West perhaps a hundred and forty Leagues in length. But no *European* has ever been over it all; only I and those who accompany'd me in this Discovery, have view'd the greater part of it, with a Vessel of Sixty Tun burden, which we caus'd to be made on purpose, about two Leagues above the fore-mention'd Fall of *Niagara*, as I shall have occasion to observe more largely hereafter.

This Lake *Erie*, or *Tejocharentiong*, encloses on its Southern Bank a Tract of Land as large as the Kingdom of *France*. It divides it self at a certain place into two Channels, because of a great Island enclos'd betwixt them: Thus continuing its course for fourteen

MESSAGE  
OF  
GOVERNOR LUCIUS ROBINSON,  
JANUARY 9, 1879.

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NIAGARA FALLS.

The civil jurisdiction over the Falls of Niagara, as well as the shores and waters of the Niagara River, is divided between this State and the Province of Ontario, in Canada. But, in one sense, the sublime exhibition of natural power there witnessed is the property of the whole world. It is visited by tourists from all quarters of the globe, and it would seem to be incumbent upon both governments to protect such travelers from improper annoyance on either side. It is, however, well known, and a matter of universal complaint, that the most favorable points of observation around the Falls are appropriated for purposes of private profit, while the shores swarm with sharpers, hucksters and peddlers, who perpetually harass all visitors. In the course of the last summer, in a casual meeting and conversation with Lord Dufferin, then Governor-General of Canada, he suggested the propriety of some steps on the part of the State of New York and the Province of Ontario to remedy these abuses which he had seen and deeply regretted. His proposition was that a sort of international park should be established, enclosing a suitable space on each side of the river from which all the annoyances and vexations referred to should be excluded. Contemplating no attempt at landscape ornamenting in the vain hope of adding anything to the natural attractions of the Falls, he thought that each government might obtain control of a sufficient area to be kept sacred to the free use of those who coming there from all parts of the world, desire to view the grand scenery without molestation. He believed that all this could be accomplished at small expense, each government of course retaining jurisdiction of its own portion of such park, but with a mutual understanding as to the general regulations to be enforced on either side. Subsequently the Governor-General called the attention of the govern-



ment of Ontario to the same matter, and recommended co-operation with the State of New York in accomplishing the purpose in view. The proper course, if such a plan were deemed advisable would, undoubtedly, be the appointment of commissions by both governments, to confer together as to its details. Should such a commission be appointed by the authorities of Ontario, I recommend that you provide for the appointment of a similar one to consider the subject. There can be no doubt that many persons abstain from visiting the Falls in consequence of the annoyances referred to, nor can there be any reasonable doubt that the removal of these objections would largely increase the number of visitors annually.





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PART II.

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FOURTH ANNUAL REPORT

OF THE

BOARD OF COMMISSIONERS OF THE STATE SURVEY.

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# REPORT.

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*To the honorable the Legislature of the State of New York :*

The Commissioners of the State Survey, in compliance with the requisitions of the acts creating the commission, respectfully report the regular proceedings of the survey and results reached during the year 1879, by transmitting the annexed report of the director, which they have adopted.

It will be seen that the work of the past season gives the means of making important additions to the State Survey map of parts of Onondaga, Oswego, Madison and Oneida counties ; locating, as it does, the geographical positions of seventeen villages and towns. In co-operation with the United States engineers in charge of the improvement of the Hudson, monuments a mile apart have been placed along both banks of the river, between Albany and New Baltimore, forming a connected series of permanent landmarks, to which will be referred both the bulk-head-lines, established by law, and the boundaries of grants of lands under water. The security of the boundaries thus established will undoubtedly prove the importance of applying elsewhere a similar system of land surveying.

All of which is respectfully submitted.

HORATIO SEYMOUR,  
*President of the Board.*  
WILLIAM A. WHEELER,  
ROB. S. HALE,  
WILLIAM DORSHEIMER,  
FRANCIS A. STOUT,  
GEORGE GEDDES,  
F. A. P. BARNARD.

## APPENDIX A.

### DETAILED STATEMENT OF EXPENDITURES DURING THE YEAR 1879.

Books .....	\$10 38
Cartage.....	3 68
Commissioners' expenses.....	161 81
Damages and rent of land.....	41 00
Expressage.....	62 65
Freight .....	24 90
Hardware.....	31 86
Harness, etc.....	11 00
Horse keeping.....	363 63
Horse shoeing.....	22 31
Horse hire and livery.....	12 00
Maps .....	35 75
Mathematical instruments.....	185 55
Messengers .....	6 20
Miscellaneous .....	6 60
Muslin, etc.....	15 62
Office of director, outfit, care and rent of .....	74 86
Postage.....	61 53
Pottery .....	20 00
Printing.....	980 40
Repairs.....	83 10
Salaries, regular.....	8,903 83
Salaries, special .....	78 25
Signal cones.....	33 65
Stationery .....	27 24
Street cars and tolls .....	7 01
Telegrams .....	23 74
Tents.....	17 79
Timber and lumber.....	58 94
Tools .....	37 66
Transportation, public .....	454 37
Wages of laborers .....	136 21
Wagons and equipments .....	29 25
<b>Total .....</b>	<b>\$11,972 77</b>

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REPORT OF THE DIRECTOR  
OF THE  
NEW YORK STATE SURVEY,  
SHOWING  
THE PROGRESS OF THE SURVEY  
DURING  
THE YEAR 1879.

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# REPORT.

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*To the Board of Commissioners of the State Survey :*

I have the honor to submit my report of the progress of the survey during the year 1879, with accompanying maps of the completed triangulation and its proposed extension during the coming season.

Provision for the survey was made in the regular appropriation bill, from which the funds were not due until October first, while the previous appropriation had been intended only for the year 1878. This so limited the means of the survey, that it was impossible to push forward the primary triangulation over the counties of Cayuga, Seneca, Yates, Tompkins, Schuyler, Tioga and Chemung, the region that it was intended to cover during the season.

The supervisors of Onondaga county had, by special resolution, requested the Survey to furnish them with a map showing accurately the areas of the townships of that county. I regret very much that the request could not be complied with, on account of want of means. Should the present Legislature make the appropriation asked for, the general extension of the triangulation to Tioga and Chemung counties can go forward as well as the important application of the work to the special want of Onondaga county of a reliable official map.

The New York commissioners charged with the duty of re-marking the Pennsylvania boundary line, have requested that points along that line should be connected with the State Survey triangulation as soon as possible. I hope that several stations answering these requirements may be established during the coming summer.

Although this report has been begun with an account of what was left undone for want of means; yet, a great deal was really accomplished with the small sum at the disposal of the Survey.

## WORK IN CENTRAL NEW YORK.

A chain of secondary triangles was laid out extending from Onondaga Hill to Amsterdam, and twenty-one tripod signals were erected at the selected points between Syracuse and Little Falls. Thirteen of these

stations were occupied, and the angles observed with a twelve-inch circle, reading seconds with micrometers. The object of this chain of triangles, whose sides average about twelve miles in length, is to form a convenient base for local surveys along the valley of the Mohawk. From the stations already fixed, the geographical positions of fifty-two points were determined in the fifteen townships of Constantia, DeWitt, Fenner, Geddes, Kirkland, Lenox, Manlius, Pompey, Rome, Steuben, Stockbridge, Sullivan, Vernon, Verona and Vienna.

The positions of prominent landmarks were fixed in sixteen villages and one city: Canastota, Cleveland, Churchville, Durhamville, Fayetteville, Fish Creek, Geddes, Higginsville, Kirkville, Manlius Station, Oneida, Vernon, Vienna, Verona, Wampsville, and the city of Rome.

The elevations of many important points were determined with precision, in order that they may be used as bases for future leveling. The measurements of vertical angles were made with a twelve-inch circle, reading with micrometers to seconds, and the chain of levels was in several places connected with benches of the canal surveys.

The fixing of these fifty-two reference points will enable us to make many needed corrections to the map of parts of Oswego, Onondaga, Madison and Oneida counties.

Reconnoissance for this triangulation began May 25th. It was conducted by Mr. O. S. Wilson, assisted by Mr. O. H. Bogardus. On the 5th of July, Mr. Bogardus took charge of the signal building party, and on the 10th of July Mr. Wilson began the measurement of angles, Mr. F. M. Rutherford acting as recorder. The building of signals was continued until September 1st, and the measurement of angles until November 20th.

#### WORK ON THE HUDSON RIVER.

In the year 1877, in accordance with a resolution of the Legislature, the Governor of this State requested the President to appoint a board of United States officers, experienced in the management of harbor and river improvements, to establish in co-operation with State authorities, bulkhead-lines along the Hudson River; the necessity for this action having arisen from the tendency of private owners to project piers and made-lands so far into the stream as seriously to interfere with its navigation. The bulkhead-line is to be the limit beyond which the State will grant no rights to the lands under water, nor allow constructions to be placed. It is, therefore, both a public line, and a boundary of private property.

Being a line in the water, its position must be fixed by reference to landmarks on the shore. The board of United States engineers therefore applied to the State Survey to co-operate with them in establishing a series of enduring monuments along both sides of the Hudson from Troy southward. The distinguished engineers saw clearly that the

absolute permanence of these reference points could be secured only by connecting them with an extended system of triangulation; and it was also evident to the Land Commissioners of the State, that grants of lands under water should be referred to the same landmarks on which the bulkhead-line was to depend.

After careful reconnoissance, with these considerations in view, Lieut. J. H. Willard, United States engineer, and myself, decided to place State Survey monuments about a mile apart along both banks of the Hudson, and to fix their positions by a chain of secondary triangles resting on the neighboring hills. The sites for monuments were chosen with special regard to convenience of local surveys, both public and private. The constant hydrographical surveys necessary to map the ever-changing channels of the river; the great value of the lands under water which the State is annually granting, and the prospective value of the shores, make it of immediate importance that all public and private surveys should have a common base, and rest on the same datum points; that their distances should be accurately measured and their courses determined from the true meridian.

The system is therefore planned to be practically a base for all surveys along the river.

The method of marking the stations is intended to make them easy to find, but difficult to destroy. A hole is dug five feet deep, and in the bottom is put an earthen crock lettered N. Y. S. S., its centre being the exact station. Over this is placed a granite post of the regular State Survey pattern, four feet long by six inches square, the upper end projecting six inches above the ground. It is marked N. Y. S. S., and the number of the station. Three feet from the centre of the stone, in directions at right angles to one another, are buried earthen pots, their tops about a foot and a half below the surface of the ground. They are like inverted flower-pots, having on the upturned surface an arrow pointing toward the station, which is exactly three feet from the center hole of the crock. The letters N. Y. S. S. are also stamped upon them.

In case the stone monument designating the station should be moved by intention, accident or frost, it can be adjusted by measurement from these witness crocks. If the stone should be entirely removed, the buried station-mark five feet below the surface could be found by means of the crocks, which are so thinly covered with earth as to be discoverable by digging. Where the soil is too shallow to support a monument, the trigonometrical station is marked by a copper bolt in the rock, and a stone post placed as near as possible, the exact distance and direction between the two being carefully measured.

Where United States Coast and Geodetic Survey stations were re-occupied, State Survey monuments were placed near and accurately connected.

Our experience has clearly shown that the stations of a trigonometrical survey are of very little use to local surveyors, unless they are marked by surface monuments easily found. The practice of the United States Coast Survey of designating their stations by underground marks, and having none on the surface, renders it impossible for ordinary surveyors to make any use of them. Although there are given in the Coast Survey map eighty-six stations in the area which we surveyed between Albany and New Baltimore, yet not one of these could have been found by a local surveyor. We discovered seven of their stations by redetermining them in the triangulation. Without re-surveying the ground, there could not have been found one of the eighty-six points, although the gentleman engaged upon this duty was an old Coast Survey assistant.

I bring forward these facts in order to illustrate the principle to which I have so often called attention, that a trigonometrical survey of a thickly settled country should be made once for all, in such a manner as to be a readily used base for local surveys of every kind. To accomplish this the purposes for which the fixed points will be needed must be foreseen, and both in their positions and method of marking, they must be adapted to these practical requirements.

I have endeavored in the work of the State Survey not only to reach a high grade of scientific accuracy, but after carefully considering the present and future wants of each part of the State, to shape the triangulation in such a way as to be of the greatest practical use; and I believe the benefits of this policy are already being felt. As soon as the triangulation was completed from Albany to New Baltimore, the Commissioners of the State Land Office passed the following resolutions:

*Resolved*, That section 4 of Rules of the land office, relating to water grants, be amended as follows: "The point of beginning of survey of the land applied for shall be defined by its true course and distance from one of the monuments established by the State survey, wherever such monuments are fixed within one mile of the grant applied for. The monument referred to shall be designated by its number, and the courses of the survey shall be given by their bearing from the true meridian established by the State Survey at said monument."

*Resolved*, That the State engineer and surveyor furnish map showing location, designation, number and surroundings of the State Survey monuments, for the use of the applicant.

From this action it will be seen that the days are passing away when boundaries of valuable estates are to be described as beginning at a stake or a pile of stones, and mapped with magnetic needle courses, which are always varying. The resolution of the Land Office is the beginning of a movement which will finally secure for all landed property permanent landmarks, and boundaries so accurately surveyed that they can at any time be retraced.

Field work on the Hudson River was begun May 27th, and ended

September 13th. Both the erection of signals and measurement of angles was done by Mr. Horace Andrews, Jr., assisted by Mr. Neville B. Craig. The State Survey twelve-inch Troughton and Simms theodolite was used in observing secondary angles, and an eight-inch Wurdemann repeating circle, belonging to the corps of United States engineers, was used in the tertiary triangulation.

#### ELEVATIONS IN ONONDAGA COUNTY.

Pompey Hill was for many years thought to be the highest point in Onondaga county; but several years ago, Mr. H. Wadsworth Clark, of Syracuse, proved that Ripley Hill was some two hundred feet higher, and thus transferred to the township of Spafford the claim of being the most elevated spot in the county. We hesitate to shake popular confidence in the superiority of Ripley Hill; but justice compels the statement, that the township of Fabius contains the loftiest mountain in Onondaga county, and one of the highest in Central New York. Its altitude is 2,020 feet, while that of Ripley Hill is only 1,968 feet.

To those seeking topographical information respecting Central New York, no part of this report will be a greater surprise than the appended table on page 94, which contains heights of some of the highest hills or mountains in the counties of Cayuga, Madison, Onondaga and Oneida, as determined by the leveling operations of the State Survey. From this table, it will be seen, that the well-known Starr Hill, in northern Oneida county, being only about 1,800 feet, is overtopped by Tassel Hill, near Waterville, which is 1,946 feet high.

Among the highest points already measured, the order of precedence in altitude seems to be:

Fabius Hill, Onondaga Co. ....	2,020 feet.
Ripley Hill, " " .....	1,968 "
Tassel Hill, Oneida " .....	1,946 "
Feuner Hill, Madison " .....	1,862 "
Starr Hill, Oneida " .....	1,800 "

When it is remembered that the lower valleys of this region are only 400 feet above the sea, and that the great differences of elevation occur within a few miles, the country may certainly be called mountainous rather than rolling; and it will be better understood why a topographical map is necessary to a proper comprehension of the physical features of the State.

## ABSTRACT OF WORK DONE DURING SEASON OF 1879.

	Central N. Y.	Hudson River.	Total.
Tripod signals erected .....	21	43	64
Stations occupied { secondary.....	18	5	18
{ tertiary.....	....	43	43
No. of points—height determined.....	12	9	21
No. of located points .....	52	85	137
Secondary horizontal angles measured .....	80	30	110
Tertiary      “      “      “      .....	144	331	475
Vertical angles measured .....	79	49	128
No. of horizontal observations.....	4,430	2,713	7,143
“   “   vertical      “      .....	478	49	527
Area included in secondary and tertiary triangulation.....	500 sq. mi.	67	567
Area included in secondary reconnoissance .....	1,300	“   70	1,370

Very respectfully submitted.

JAMES T. GARDNER,

*Director.*

## APPENDIX.

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### EXPLANATION OF THE TABLES.

As the central chain of primary triangles across the State has not yet been completed or adjusted, the geographical positions now given are preliminary and approximate.

The eastern group of points depends upon the initial latitude and longitude used by the United States Coast Survey, which is the most accurate we have, since it is the mean of observations taken at many widely separated places and reduced geodetically to one station. Future corrections to these points will therefore be very small. But the western group depending, as it does, on a few determinations of positions along the shore of Lake Ontario, used for preliminary results by the United States Survey of the Western and Northwestern Lakes, will be liable to a larger correction when the work is all reduced to one base. It is not anticipated that the change in geographical positions will be large enough to show on a map of 1:300000 scale, and the azimuths and distances between points are accurate to within the figures given. In the table the places are classified by counties in alphabetical order.

The first column on the left contains names of the several stations or triangulation points. These are generally either prominent objects of permanence—such as spires, or they are points on commanding hills where signals have been erected for the purposes of the survey, and which are marked on the ground by granite monuments four feet long. The stones project six inches above the surface, and are engraved with the letters N. Y. S. S., and the number of the station. Beneath the centre of the monument, generally five feet below the surface, an earthen crock is placed; the hole in its top indicating the exact spot located.

Sketches have been made showing the configuration of the land around these stations, and their exact relation to the most prominent neighboring objects, including buildings, fences, roads, etc. These will serve hereafter to assist surveyors in finding points that have for any reason become obscure.

In cases where minute descriptions are thus required, they may be had by application addressed to the Director of the New York State Survey, Albany.

Names of primary triangulation stations are in small capitals. All azimuths are reckoned from the south, around to the right through the west, so that the azimuth of points due south, west, north and east, are respectively 00°, 90°, 180°, 270°.

The column headed "Azimuth," gives the true bearing from the



station in the first column to the one in the ninth column. The Back Azimuth shows the true bearing from the stations in column nine to those in column one.

The length of the meter used, is 39.3704 inches, or 3.2809 feet, or 1.0936 yards.

After the table of geographical positions of stations comes a table of points on county lines, which have been carefully determined.

A new table follows containing the location of corners of lots in the old rectangular surveys. These old lot corners are the reference points on which land titles rest. They can only be preserved by accurately fixing their position. Every effort will therefore be made to add to this table.

The next table is also new. It gives a list of the elevations of fifty points, determined by careful trigonometrical leveling between State Survey stations, the chain being connected with the canal leveling of 1876, at Clyde, Salina, Kirkville and Canastota. The results of these checks indicate that the uncertainties of the elevations given are not so great as those from ordinary leveling operations over the same ground. The initial datum plane for heights is considered the mean level of the sea, as determined by the U. S. Coast Survey at Governor's Island, New York. From the Governor's Island tide gauge a line of levels has been run by the Coast Survey up the Hudson to Albany, where the benches have been carefully connected with those of the Erie canal. It is upon this chain that the elevations given in the table depend.

The last table is one showing the approximate variation of the magnetic needle from true north at thirty-four points, distributed through nine counties. They are given with enough precision to meet the requirements of common surveying. The table has more than double the information contained in that of last year.

JAMES T. GARDNER,

*Director.*

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# TABLES.

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NEW YORK STATE SURVEY.—PRELIMINARY GEOGRAPHICAL POSITIONS.  
ALBANY COUNTY.

NAME OF STATION.	No. of monument.	Township.	No. of lot.	Owner's name.	Latitude.	Longitude.	Azimuth.	To station.	Back Azimuth.	DISTANCE.	
										Me- ters.	Miles.
HEIDERBERG .....	U.S.C.S.	New Scotland....	....	D. Flansburgh.....	43 37 38	74 00 38	340 47 50	Rafnesque .....	61 08 53	38986	23 970
Baker .....	168	Bethlehem .....	....	C. V. Baker.....	43 31 47	78 46 01	80 46 25 189 61 31	Vrooman..... Vanderzee (bolt),	310 46 00 339 01 15	2242 1457	1.485 0.924
Bethlehem.....	3	Bethlehem .....	....	Ezra Swartwout.....	43 34 44	73 47 53	.....	Heiderberg .....	296 56 47 296 09 59	18259 16314	11 345 9 703
Blodget.....	4	Coeymans.....	....	Wolsey Blodget.....	42 30 55	73 53 46	.....	Heiderberg .....	332 43 40 37 08 11	15098 39048	9 684 23 641
Cass .....	7	New Scotland....	....	Mary A. Cass .....	43 34 11	73 59 16	238 18 38 178 45 44	Ferris..... Countryman ....	58 28 09 308 45 41	22542 5228	14 006 3 243
Cedar Hill.....	Bolt.	Bethlehem .....	....	.....	43 32 56	73 45 34	238 46 39 225 61 13	Van Denb'h(bolt), Campbell's Isl'd.,	78 47 35 45 61 32	1944 890	1.208 0.553
Clarkville.....	6	New Scotland....	....	Dr. C. J. Cronse.....	42 34 31	73 57 39	113 07 45 74 30 58	Countryman .....	333 06 36 254 19 52	5162 2307	3 207 1.434
Corning.....	147	Bethlehem .....	....	Erastus Corning .....	42 36 53	73 45 16	252 41 50 259 53 30	Ryseedorph (C. S.) Grandview .....	72 43 55 119 55 04	4385 3633	2.781 2.257
Countryman .....	8	New Scotland....	....	Mr. McNeery .....	42 37 00	73 59 21	177 46 17 217 36 19	Van Attn .....	387 45 39 87 42 41	31998 20981	19 880 13 037
Dominles Hook.....	Bolt.	Bethlehem .....	....	.....	42 35 41	73 45 51	165 54 04 240 34 51	Corning..... Teiler .....	345 53 48 60 30 02	2282 2746	1.418 1.707
Dominles Hook.....	165	Bethlehem .....	....	.....	42 35 41	73 45 52	327 18	Dominles Hook.. (bolt).	47 18	13	0.008
Ferris.....	1	Watervliet .....	....	Mr. Van Rensselaer..	43 40 34	73 45 14	75 38 09 333 11 02	Heiderberg .....	235 22 42 153 12 25	21706 6182	13 525 3 341

Fredegh .....	Pot.	Watervliet .....	....	Lewis Dederick .....	49 46 84	73 47 18	60 28 16	69 28 16	Landing Pine .....	249 29 57	4987	8,009
Gulderland .....	11	Gulderland .....	....	Abram Van Hensen ..	49 43 01	73 58 02	74 01 02	253 56 10	Niakayuna .....	253 56 10	3913	3,433
Hamiltonville .....	.....	Gulderland .....	....	.....	49 43 28	73 55 13	163 24 00	296 12 10	Helderberg .....	253 44 32	3874	5,514
Knorrsville .....	9	Gulderland .....	....	Church property .....	49 43 11	74 02 01	39 40 53	11637	Winn .....	296 12 10	6968	4,819
Landing Pine .....	15	Watervliet .....	....	Benjamin Landing ..	49 45 37	73 50 38	233 46 22	219 36 03	Van Alten .....	249 30 34	23932	14,349
Mull .....	169	Coeymans .....	....	E. T. E. Bronk .....	49 29 53	73 47 05	252 30 34	11637	Helderberg .....	249 30 34	11637	7,253
Niakayuna .....	18	Watervliet .....	....	Shaker family .....	49 45 50	73 49 58	261 54 33	1074	Lansing Pine .....	249 30 34	1074	10,487
Paarda Hook .....	Bolt.	Bethlehem .....	....	John D. Parsons .....	49 33 17	73 45 26	188 00 18	3625	Little's Hill .....	249 30 34	3625	3,190
Parke .....	Bolt.	Bethlehem .....	....	P. Wendell Parke ..	49 35 58	73 46 06	333 30 34	0,701	Niakayuna .....	249 30 34	1198	0,701
Patterson .....	157	Bethlehem .....	....	On Beacon Island .....	49 38 12	73 45 50	155 32 20	20103	Traver (U.S.C.S.) ..	249 30 34	20103	12,523
Boha Hook .....	174	Coeymans .....	....	B. Ten Eyck .....	49 29 01	73 47 24	228 19 35	1,937	Helderberg .....	249 30 34	1074	0,979
Schermerhorn Island .....	163	Bethlehem .....	....	On Schermerhorn Isl.	49 31 19	73 46 00	46 53 07	196 83 51	Traver (U.S.C.S.) ..	249 30 34	196 83 51	11,110
Shad Island .....	171	Coeymans .....	....	Robert Shaver .....	49 30 52	73 46 23	320 44 00	21261	Traver (U.S.C.S.) ..	249 30 34	21261	13,213
Little's Hill .....	10	Gulderland .....	....	Silas Winn .....	49 44 05	74 02 10	269 55 06	1,096	Traver (U.S.C.S.) ..	249 30 34	2407	0,969
Slingerland .....	5	New Bethlehem .....	....	Wm. H. Slingerland ..	49 37 34	73 51 59	57 56 13	1,979	Ten Eyck (C. S.) ..	249 30 34	3184	3,643
Smith .....	.....	Knox .....	....	M. H. Smith .....	49 44 37	74 04 48	84 12 57	1,876	Vrooman .....	249 30 34	3215	1,816
Van Dalben .....	177	Coeymans .....	....	Road alide .....	49 28 00	73 47 33	294 45 00	2,046	Clapper .....	249 30 34	733	0,455
									Traver (U.S.C.S.) ..	249 30 34	1638	1,046
									Vrooman .....	249 30 34	1555	0,966
									Traver (U.S.C.S.) ..	249 30 34	1776	0,463
									Helderberg .....	249 30 34	24571	21,663
									Little's Hill .....	249 30 34	12150	7,531
									Cass .....	249 30 34	11773	7,815
									Countryman .....	249 30 34	10134	6,297
									Winn .....	249 30 34	3344	2,078
									Orchard .....	249 30 34	733	0,458
									Beil .....	249 30 34	2062	1,281

# NEW YORK STATE SURVEY.—PRELIMINARY GEOGRAPHICAL POSITIONS—(Continued).

## ALBANY COUNTY—(Continued).

NAME OF STATION.	No. of monument.	Township.	No. of lot.	Owner's name.	Latitude	Longitude.	Azimuth.	To station.	Back Azimuth.	DISTANCE.	
										Me- ters.	Miles.
Vanderzee.....	Bolt.	Bethlehem.....	....	John G. Vanderzee..	42 32 32	73 46 25	349 35 39 348 34 35	Van Denb'h(bolt), Traver(U.S.C.S.),	69 37 10 186 35 06	3273 4391	2 034 3.728
Vanderzee.....	145	Bethlehem.....	....	John G. Vanderzee..	42 32 32	73 46 25	6 56 09	Vanderzee (bolt),	186 58 09	6	0 004
Van Wie.....	146	Bethlehem.....	....	Dr H. Wendell.....	42 34 53	73 45 23	154 18 11 218 28 56	Parke..... Belvedere.....	334 17 43 38 29 40	2321 2356	1.330 1.465
Vrooman.....	154	Coeymans.....	....	Cornelius Vrooman..	42 30 41	73 46 51	219 25 03 297 18 44	Van Denb'h(bolt), Traver(U.S.C.S.),	89 28 69 117 19 34	5890 1897	3 653 1.179
Winn.....	.....	Guilderland.....	....	Silas Winn.....	42 43 48	74 03 33	.....	Stille's Hill..... Heisterberg.....	45 56 14 167 13 12	783 11733	0.455 7.284
Winnies Dock.....	160	Bethlehem.....	....	Peter Van Wie.....	42 33 52	73 45 18	311 24 39 309 15 41	Van Denb'h(bolt), Muller.....	131 25 24 29 15 53	3043 791	1 271 0.494
Winnies Point.....	U.S.C.S.	Bethlehem.....	....	John D. Parsons.....	42 33 17	73 45 26	24 10 30	Paarda Hook....	204 10 30	3	0 003
Westerloe Island.....	170	Bethlehem.....	....	Mr. Van Benseeker..	42 37 19	73 45 41	307 25 56 230 37 52	Teller..... Moles.....	127 27 01 50 33 13	2731 1132	1.637 0.537
<i>Albany City.</i>											
Court House.....	.....	.....	....	.....	42 39 05	73 45 19	.....	Ferris..... Rysedorph.....	9 18 13 133 45 49	2745 4013	1.706 2.494
Cathedral spire.....	.....	.....	....	.....	42 38 50	73 45 33	.....	Ferris..... Rysedorph.....	8 57 11 124 57 19	3253 4020	3.023 3.496
Convent of the Sacred Heart,	.....	.....	....	.....	42 37 39	73 46 22	.....	Ferris..... Rysedorph.....	10 55 43 91 26 11	7696 4334	3.496 2.683

Catholic ch. sp., North Albany,	.....	.....	.....	.....	.....	Ferris	393 43 25	1286	0.768
Congregational church spire..	.....	.....	.....	.....	.....	Rysedorph	161 54 25	5362	3.295
Ch. of our Lady of Angels (twr.)	.....	.....	.....	.....	.....	Ferris	5 53 01	3075	1.880
Dudley observatory (centre of Equatorial dome).	.....	.....	.....	.....	.....	Rysedorph	129 00 13	3987	2.477
Fourth Presb. church spire...	.....	.....	.....	.....	.....	Ferris	38 44 48	2066	1.283
Lark St. M. E. church spire..	.....	.....	.....	.....	.....	Rysedorph	133 46 45	5650	3.511
Old Capitol (head of statue)...	.....	.....	.....	.....	.....	Ferris	348 41 48	1376	0.805
State St. Presb. church spire..	.....	.....	.....	.....	.....	Rysedorph	148 52 25	4870	3.026
Second Presb. church spire...	.....	.....	.....	.....	.....	Ferris	351 23 30	2349	1.460
St. Peter's church spire	.....	.....	.....	.....	.....	Rysedorph	142 40 49	4018	2.497
St. Paul's Luth. church spire,	.....	.....	.....	.....	.....	Ferris	22 30 29	2688	1.608
St. Patrick's E. C. church sp..	.....	.....	.....	.....	.....	Rysedorph	129 37 30	4906	3.048
State Hall (flag pole).....	.....	.....	.....	.....	.....	Ferris	5 28 24	2765	1.718
Tabernacle Bapt church sp..	.....	.....	.....	.....	.....	Rysedorph	182 13 29	4116	2.557
Water Works chimney ..	.....	.....	.....	.....	.....	Ferris	14 06 26	2903	1.617
Water Works gate-house pole,	.....	.....	.....	.....	.....	Rysedorph	131 10 57	4547	2.825
Adamsville M. E. church.....	.....	.....	.....	.....	.....	Ferris	359 30 12	2810	1.746
	.....	.....	.....	.....	.....	Rysedorph	134 25 15	3899	2.404
	.....	.....	.....	.....	.....	Ferris	1 11 32	2839	1.777
	.....	.....	.....	.....	.....	Rysedorph	133 02 49	3886	2.421
	.....	.....	.....	.....	.....	Ferris	33 00 42	2924	1.444
	.....	.....	.....	.....	.....	Rysedorph	131 52 13	5402	3.356
	.....	.....	.....	.....	.....	Ferris	46 31 10	2080	1.261
	.....	.....	.....	.....	.....	Rysedorph	134 03 36	5928	3.684
	.....	.....	.....	.....	.....	Ferris	1 36 44	2885	1.668
	.....	.....	.....	.....	.....	Rysedorph	134 47 01	4023	2.500
	.....	.....	.....	.....	.....	Ferris	356 23 46	2264	1.469
	.....	.....	.....	.....	.....	Rysedorph	140 07 42	4115	2.557
	.....	.....	.....	.....	.....	Ferris	79 43 02	2043	1.269
	.....	.....	.....	.....	.....	Rysedorph	137 03 23	7011	4.375
	.....	.....	.....	.....	.....	Ferris	81 23 14	2202	1.268
	.....	.....	.....	.....	.....	Rysedorph	136 17 04	7184	4.464
	.....	.....	.....	.....	.....	Heldenberg	272 05 31	14304	8.388
	.....	.....	.....	.....	.....	Case	244 46 45	15716	8.523

NEW YORK STATE SURVEY.—PRELIMINARY GEOGRAPHICAL POSITIONS—(Continued).  
ALBANY COUNTY—(Continued).

NAME OF STATION.	No. of monu- ment.	Township.	No. of lot.	Owner's name.	Latitude.	Longi- tude.	Azimuth.	To station.	Back Azimuth.	DISTANCE.	
										Me- ters.	Miles.
Barren Island summer-house flag pole.	.....	Coeymans.....	....	.....	42 28 04	73 47 13	.....	Orchard.....	.....	1005	0.624
Briggs' Monument, Coeymans cemetery.	.....	Coeymans.....	....	.....	42 28 00	73 47 43	283 28 43	Van Dalseen .....	211 81 14	471	0.293
Clarksville D. R. church sp...	.....	New Scotland...	....	.....	42 24 33	73 57 40	308 03 13	Bell .....	108 29 49	2299	1.429
Coeymans Academy.....	.....	Coeymans.....	....	.....	42 28 23	73 47 56	.....	Whannel. ....	128 04 23	2864	1.841
Coeymans dock flag pole.....	.....	Coeymans.....	....	.....	42 28 23	73 47 24	253 47 40	Clarksville .....	112 13 43	35	0.021
Cross-over Light house.....	.....	Bethlehem .....	....	.....	42 36 48	73 45 46	247 28 53	Cass .....	253 47 52	2230	1.417
D. R. ch. south of Bethlehem, Au station.	.....	Bethlehem .....	....	.....	42 33 42	73 48 20	258 47 40	Yellow Pine (C.S.) .....	78 52 42	10415	6.471
Deserted Luth. ch. sp. 14 miles west of Guilderland.	.....	Guilderland.....	....	.....	42 42 32	73 59 56	222 02 36	Traver (U.S.C.S.) .....	43 04 08	4636	2.873
Dunaville (flag pole) .....	.....	Guilderland.....	....	.....	49 44 23	74 01 03	179 56 37	Roha Hook. ....	359 56 37	1290	0.803
Dunaville P. O. church spire...	.....	Guilderland.....	....	.....	42 44 24	73 58 35	261 14 56	Mull's Island. ....	81 15 09	440	0.273
East Township Bapt. ch. sp...	.....	Knox.....	....	.....	42 43 13	74 05 42	247 28 53	Rysedorph (C.S.) .....	87 30 37	2813	2.369
Feura Bush D. R. church sp...	.....	New Scotland...	....	.....	49 34 35	73 59 53	108 47 08	Cornig .....	293 46 48	692	0.430
							.....	Cass .....	273 24 15	14994	9.317
							.....	Holderberg .....	293 17 38	10361	11.403
							.....	Winn.....	303 17 53	4281	2.690
							.....	Holderberg .....	196 10 53	9134	5.676
							.....	Holderberg .....	171 31 46	12089	7.790
							.....	Ferris .....	108 14 38	22737	14.123
							.....	Stille's Hill .....	259 21 43	4534	2.817
							.....	Au station 74 ....	294 10 53	2234	1.363
							.....	Van Alten .....	18 21 07	23539	14.631
							.....	Stille's Hill .....	15 24 34	6926	3.693
							.....	Rysedorph .....	87 19 57	14576	8.933
							.....	Ferris .....	43 26 00	10284	9.406

Gulderland church spire.....	.....	.....	42 42 14	73 58 10	.....	Winn.....	235 56 03	6819	4 133
Hamiltonville M. E. ch sp ..	.....	.....	43 42 16	73 54 43	.....	Hellerberg .....	201 39 48	9170	5 698
Home Lawn, flag pole.....	.....	.....	43 43 41	73 45 36	.....	Hellerberg .....	223 31 12	11817	7 343
Knoxville M. E. church spire,	.....	.....	42 40 23	74 06 18	.....	Hamiltonville....	297 34 45	788	0 490
Lisba's Kill P. O., D. R. ch....	.....	.....	42 45 30	73 52 36	.....	Hellerberg .....	241 16 19	23421	14 553
Lutheran ch sp., 2 miles east of Knoxville.	.....	.....	42 40 33	74 04 45	.....	Sutle's Hill .....	271 43 08	22615	14 052
New Scotland Presb ch. twr.	.....	.....	42 37 62	73 54 25	.....	Van Atten.....	17 46 22	26496	16 775
N. Y. C. R. R. shops, W. Alb., tall chimney	.....	.....	43 40 33	73 46 30	.....	Babcock .....	249 45 21	14137	8 736
Paarida Hook Light-house....	.....	.....	42 31 16	73 45 26	24 10	Lansing Pine ....	79 04 56	2734	1 699
Patterson's House, so. chim- ney of.	.....	.....	42 35 08	73 46 27	238 48 16	Cass .....	203 46 14	22577	14 039
Roha Hook Light-house.....	.....	.....	42 28 49	73 47 20	376 53 32	Heiderberg .....	13 35 47	25094	16 153
School-ho. cupola, near Mull's,	.....	.....	42 30 24	73 47 17	321 15 19	Van Atten.....	224 10 50	9625	5 919
Slingerland church spire.....	.....	.....	42 37 49	73 51 39	371 56 03	Cass .....	99 45 03	3377	2 099
Sloan's Hotel, flag po. in ft of,	.....	.....	43 42 11	73 54 37	378 37 09	Ferris .....	93 55 09	1748	1 086
Unionville D. R. church sp....	.....	.....	49 35 02	73 53 28	326 46 40	Rysedorph . ....	141 13 11	7323	4 494
Van Wie's stone Light-house.	.....	.....	49 35 04	73 45 30	.....	Paarida Hook ....	204 10	3	0 002
						Rysedorph (C. S.)	58 50 23	5221	3 245
						Grandview .....	96 55 13	3443	3 140
						Traver (U.S.C.S.)	41 16 26	3462	2 152
						Ten Eyck (C. S.)	91 57 03	2050	1 273
						Traver (U.S.C.S.)	98 38 14	2228	1 385
						Ten Eyck (C. S.)	146 47 38	3698	2 232
						Cass .....	237 08 09	12405	7 708
						Helderberg .....	238 18 13	12311	7 650
						Helderberg .....	224 17 40	11908	7 337
						Hamiltonville ...	901 17 13	974	0 505
						Rysedorph .....	78 28 33	14334	8 907
						Helderberg .....	236 39 57	10267	6 380
						Van Wie .....	154 37 24	366	0 227
						Cooper .....	96 08 45	385	0 245



NEW YORK STATE SURVEY.—PRELIMINARY GEOGRAPHICAL POSITIONS—(Continued).  
CAYUGA COUNTY.

NAME OF STATION.	No. of monument.	Township.	No. of lot.	Owner's name.	Latitude.	Longitude.	Azimuth.	To station.	Back Azimuth.	DISTANCE.	
										Me- ter.	Miles.
NILES .....	107	Niles .....	25	Thomas Fitzpatrick.	43 47 57	76 26 10	128 47 31	Clyde .....	308 29 58	44983	27.891
VICTORY .....	U.S.L.S.	Victory .....	30	John Jewell .....	43 18 07	76 36 29	48 33 42	Victory .....	843 13 37	49653	30.536
Mitchell .....	115	Sennett .....	Ret. 39248	John Mitchell .....	42 56 35	76 31 53	113 56 33	Clyde .....	928 23 08	28000	17.398
Tanner .....	116	Brutus .....	87	S. B. Tanner .....	43 01 15	70 33 37	97 53 16	Niles .....	938 43 53	29790	18.513
Auburn city, dome of Court- House.	.....	Auburn city .....	.....	.....	43 55 48	76 34 16	169 57 51	Clyde .....	184 05 43	17785	11.051
							323 46 56	Victory .....	377 40 46	25123	15.610
							119 25 35	Clyde .....	849 55 54	23314	13.865
							323 46 56	Clyde .....	299 19 33	37546	17.117
							143 52 35	Niles .....	143 52 35	18945	11.337
COLUMBIA COUNTY.											
Bell .....	183	Stuyvesant .....	.....	R. W. Bell .....	43 27 43	73 46 05	84 16 20	Orchard .....	294 15 29	2074	1.299
Bluff .....	184	Stuyvesant .....	.....	Roadside .....	43 26 51	73 46 19	355 41 21	Whannel .....	175 41 23	1295	0.804
Hotaling Island .....	179	Stuyvesant .....	.....	On Hotaling Island ..	43 26 54	73 46 56	60 07 34	Parsons .....	936 58 42	17359	1.081
Lower Schoedack Island .....	180	Stuyvesant .....	.....	On S end of Island ..	43 27 41	73 46 34	117 36 38	Vanderpoel .....	240 06 55	1629	0.880
Whannel .....	185	Stuyvesant .....	.....	John Whannel .....	43 27 01	73 46 01	29 07 49	Parsons .....	297 26 14	913	0.563
Barren Island pine (county corner).	.....	.....	.....	Knickerbocker Ice Co.	43 27 51	73 47 09	6 44	Vanderpoel .....	209 07 85	972	0.604
Five Hook Island Light-house	.....	Stuyvesant .....	.....	.....	43 27 47	73 46 56	275 35 15	Parsons .....	239 40 21	1558	0.980
							34 21 05	Bluff .....	167 09 29	1552	0.864
								Parsons .....	333 24 56	4293	2.649
								Orchard .....	296 37 23	2415	1.503
								Barren Island .....	186 44	42	0.026
								Bluff .....	96 26 49	1167	0.725
								Parsons .....	214 30 40	1464	0.909

[illegible]

**GREENE COUNTY.**

[illegible]

**NEW YORK STATE SURVEY.—PRELIMINARY GEOGRAPHICAL POSITIONS—(Continued).**  
**GREENE COUNTY—(Continued).**

NAME OF STATION.	No. of monument.	Township.	No. of lot.	Owner's name.	Latitude.	Longitude.	Azimuth.	To station.	Back Azimuth.	DISTANCE.	
										Me.	Miles.
Dutch Reformed church .....	.....	New Baltimore ..	.....	.....	42 26 43	73 47 21	349 16 29 238 35 53	Vanderpoel .....	169 16 30 56 36 09	511 666	0.318 0.414
Methodist Episcopal church.	.....	New Baltimore ..	.....	.....	42 26 52	73 47 18	338 13 40 262 53 50	Vanderpoel .....	178 13 40 92 54 04	788 501	0.489 0.312
Riverside House sum. house flag pole.	.....	New Baltimore ..	.....	.....	42 26 42	73 47 14	220 08 44 251 07 14	Bell .....	40 09 31 71 08 03	2435 1762	1.514 1.094
Ship yard, chimney of .....	.....	New Baltimore ..	.....	.....	42 26 38	73 47 13	14 08 40 246 43 29	Vanderpoel .....	194 08 38 96 44 18	350 1806	0.217 1.122

**HERKIMER COUNTY.**

BAETO HILL.....	28	Fairfield .....	.....	Alevata Wilson.....	43 07 48	74 53 25	338 32 16 179 14 17	East Hill .....	158 39 53	41698	25.865
								Royal Hill .....	99 29 30	30629	19.094

**MADISON COUNTY.**

FENNER.....	180	Fenner .....	29	Orville E. Wormuth..	42 57 24	75 44 42	96 04 01 131 23 29	Howlett Hill.....	276 41 37	44387	27.892
Allis .....	121	Lenox.....	3	Joel Allis .....	43 05 18	75 43 13	53 17 18 90 46 10	Eagle .....	311 00 45	59838	37.218
Bulger .....	112	Lenox.....	6	Edward Bulger .....	43 05 56	75 40 06	67 08 36	Kirkville .....	233 12 29	11980	7.444
Canastota .....	143	Lenox.....	1	James C. New .....	43 04 21	75 44 27	109 09 17 20 46 24	Allis .....	260 40 36	11231	6.973
Cranston.....	122	Lenox.....	29	Assa Cranston .....	43 01 04	75 43 09	83 09 24 160 14 29	Cranston .....	292 56 06	11303	7.023
Eaton .....	139	Stockbridge.....	3	Ozias A. Eaton.....	43 01 44	75 33 26	92 25 50	Allis .....	237 04 29	9706	6.068
								Allis .....	239 05 42	5416	3.885
								Eagle .....	260 45 15	6469	4.032
								Allis .....	273 03 10	19443	7.732
								Vlenna .....	340 13 04	5394	3.178
								Fenner .....	337 17 14	29673	16.326
									242 18 08	17290	10.749

[ASSEMBLY,

Bridgeport M. E. church.....	Sullivan.....	43 09 23	75 53 19	844 29 54	Eagle.....	161 26 58	15238	9,500
Canastota Baptist church....	Lenox.....	43 04 29	75 45 15	312 56 23	Cranson.....	133 03 41	22594	14,083
Canastota Free church.....	Lenox.....	43 04 43	75 45 18	262 49 57	Cranson.....	190 53 19	6430	3,998
Canastota M. E. church.....	Lenox.....	43 04 53	75 45 26	299 81 15	Canastota.....	102 50 30	1109	6,889
Free Methodist church, near Chittenango Station.	Sullivan.....	43 05 16	75 53 30	7 44 12	Cranson.....	189 43 18	6816	4,325
Fyler Wesleyan Meth. ch.....	Sullivan.....	43 05 41	75 54 57	305 33 25	Canastota.....	119 31 49	1820	8,200
Oneida Baptist church.....	Lenox.....	43 05 38	75 39 13	28 13 56	Cranson.....	187 43 44	7063	4,408
Oneida Opera House dome..	Lenox.....	43 05 45	75 39 17	311 56 39	Eagle.....	125 34 06	1654	1,057
Oneida Presbyterian church..	Lenox.....	43 05 39	75 39 18	3 25 34	Cranson.....	208 13 01	8936	4,893
Perryville P. E. church.....	Fenner.....	43 00 25	75 43 04	37 53 33	Eagle.....	133 00 59	11594	7,204
Quality Hill Presb. church...	Lenox.....	43 04 04	75 46 40	21 09 02	Kirkville.....	183 25 30	7879	4,896
Ridgerville Presb. church.....	Lenox.....	43 07 53	75 47 36	71 19 30	Bulger.....	217 53 33	3175	1,973
Wampsville Presb. church...	Lenox.....	43 04 30	75 49 27	100 54 09	Bulger.....	201 06 25	3855	2,085
				130 04 47	Canastota.....	251 33 41	7490	4,664
				137 23 13	Bulger.....	198 25 57	3326	2,191
				239 56 52	Canastota.....	249 45 35	7471	4,643
				327 27 23	Bulger.....	200 40 57	5383	3,102
				73 00 41	Canastota.....	251 16 56	7486	4,663
				288 13 06	Gilbertsville.....	309 44 21	53739	32,802
					Eagle.....	280 49 13	9686	6,312
					Allis.....	317 23 09	3197	1,843
					Canastota.....	79 53 23	3033	1,597
					Cranson.....	171 14 49	15902	8,017
					Canastota.....	147 29 31	7923	4,926
					Eagle.....	251 51 53	18396	11,393
					Bulger.....	106 14 41	3833	2,060

## MONTGOMERY COUNTY.

Black.....	Amsterdam.....	43 53 43	74 10 05	.....	Glen.....	293 02 12	16145	10,033
Pot.....	Robert Black.....	.....	.....	.....	Waterstreet.....	148 13 13	16069	9,393
Bronk.....	Amsterdam.....	43 56 53	74 06 36	.....	Waterstreet.....	168 55 58	3377	5,860
Pot.....	Philip Bronk.....	.....	.....	.....	Dougall.....	199 13 37	7344	4,568
Dougall.....	Florida.....	43 53 03	74 07 23	287 31 24	Van Allen.....	77 36 14	9901	6,153
Pot.....	James Dougall.....	.....	.....	300 01 13	Waterstreet.....	150 03 30	4921	3,065

# NEW YORK STATE SURVEY.—PRELIMINARY GEOGRAPHICAL POSITIONS—(Continued).

## GREENE COUNTY—(Continued).

NAME OF STATION.	No. of monument.	Township.	No. of lot.	Owner's name.	Latitude.	Longitude.	Azimuth.	To station.	Back Azimuth.	DISTANCE.	
										Me- ters.	Miles.
Dutch Reformed church .....	.....	New Baltimore ..	.....	.....	42 28 43	73 47 21	349 16 28 238 35 53	Vanderpoel .....	189 16 30 58 36 09	511 666	0.318 0.414
Methodist Episcopal church, .....	.....	New Baltimore ..	.....	.....	42 28 52	73 47 18	338 13 40 282 53 50	Vanderpoel .....	178 13 40 82 54 04	788 501	0.489 0.319
Riverside House sum. house flag pole. ....	.....	New Baltimore ..	.....	.....	42 28 42	73 47 14	220 08 44 251 07 14	Bell .....	40 09 31 71 08 03	9435 1762	1.514 1.094
Ship yard, chimney of .....	.....	New Baltimore ..	.....	.....	42 28 38	73 47 13	14 08 40 246 43 29	Vanderpoel .....	194 08 38 06 44 18	350 1866	0.217 1.122

## HERKIMER COUNTY.

BARTO HILL.....	28	Fairfield .....	.....	Atevata Wilson.....	43 07 48	74 53 25	338 83 16 279 14 17	East Hill.....	158 39 53	41808	25.865
								Royal Hill .....	99 29 30	30629	19.094

## MADISON COUNTY.

FENNER.....	130	Fenner.....	29	Orville E. Wormuth..	42 57 24	75 44 42	96 04 01 131 23 29	Howlett Hill.....	276 41 87	44387	27.892
Allis .....	121	Lenox.....	3	Joel Allis .....	43 05 18	75 43 13	35 17 18 80 46 10	Gilbertsville .....	311 00 45	59638	37.213
Bulger .....	119	Lenox.....	6	Edward Bulger .....	43 03 56	75 40 06	103 01 38 57 08 36	Eagle .....	933 12 29	11980	7.444
Canastota .....	143	Lenox.....	1	James C. New .....	43 04 21	75 44 27	109 09 17 20 46 24	Kirkville .....	290 40 36	11321	6.973
Cranston .....	122	Lenox.....	29	Asa Cranston .....	43 01 04	75 46 09	93 09 34 160 14 29	Allis .....	999 56 06	11303	7.023
Eaton .....	129	Stockbridge.....	3	Ozias A. Eaton.....	43 01 44	75 33 26	167 22 21 82 25 50	Cranston .....	237 04 29	9766	6.068
								Allis .....	989 06 42	5416	3.385
								Cranston .....	200 45 15	6469	4.053
								Eagle .....	973 08 10	19418	7.783
								Allis .....	340 13 04	8334	5.178
								Vlenna .....	337 17 14	29273	16.326
								Fenner .....	242 18 08	17266	10.749

Bridgeport M. E. church.....	Sullivan.....	43 09 23	75 53 19	344 23 54 312 06 25	Eagle..... Cranston.....	161 26 58 133 03 41	15288 22564	9 800 14 083
Canastota Baptist church....	Lenox.....	43 04 29	75 45 15	10 56 55 293 49 57	Cranston..... Canastota.....	190 55 19 102 50 30	6430 1109	3 996 6 889
Canastota Free church.....	Lenox.....	43 04 43	75 45 18	9 43 53 299 81 16	Cranston..... Canastota.....	189 43 18 119 81 49	6816 1320	4 235 8 200
Canastota M. E. church.....	Lenox.....	43 04 59	75 45 26	7 44 12 305 53 25	Cranston..... Canastota.....	187 43 44 125 34 06	7083 1654	4 408 1 057
Free Methodist church, near Chittenango Station.	Sullivan.....	43 05 16	75 53 30	28 18 56 311 56 39	Eagle..... Cranston.....	208 13 01 132 00 59	8936 11594	4 928 7 204
Fyler Wesleyan Meth. ch.....	Sullivan.....	43 05 41	75 54 57	3 35 34 27 53 33	Eagle..... Kirbyville.....	183 25 30 217 53 33	7879 3176	4 896 1 973
Oneida Baptist church.....	Lenox.....	43 05 38	75 39 13	21 09 02 71 57 16	Bulger..... Canastota.....	201 08 25 251 53 41	2855 7490	2 035 4 664
Oneida Opera House dome..	Lenox.....	43 05 45	75 39 17	18 26 31 69 49 07	Bulger..... Canastota.....	198 25 57 249 45 35	2626 7471	2 191 4 643
Oneida Presbyterian church..	Lenox.....	43 05 39	75 39 18	20 41 33 71 19 30	Bulger..... Canastota.....	200 40 57 251 15 56	5383 7436	2 102 4 663
Perryville P. E. church.....	Fenner.....	43 00 25	75 48 04	130 04 47 100 54 09	Gilbertsville..... Eagle.....	309 44 21 280 49 13	52789 9996	32 809 6 213
Quality Hill Presb. church...	Lenox.....	43 04 04	75 46 40	137 23 13 239 56 52	Allis..... Canastota.....	317 23 09 79 58 23	3127 3033	1 943 1 587
Ridgville Presb. church.....	Lenox.....	43 07 58	75 47 36	351 13 50 327 27 25	Cranston..... Canastota.....	171 14 49 187 23 51	13602 7925	8 017 4 926
Wampsville Presb. church...	Lenox.....	43 04 30	75 49 27	73 00 41 288 13 06	Eagle..... Bulger.....	251 51 53 108 14 41	13336 2853	11 338 2 060

## MONTGOMERY COUNTY.

Black.....	Pot.	Amsterdam.....	43 58 43	74 10 05	Glen..... Waterstreet.....	283 02 12 145 13 13	16145 10069	10 083 9 363
Bronk.....	Pot.	Amsterdam.....	43 58 53	74 05 36	Waterstreet..... Dougall.....	168 55 58 199 13 37	9377 7344	5 950 4 568
Dougall.....	Pot.	Florida.....	43 53 06	74 07 23	Van Allen..... Waterstreet.....	77 26 14 130 03 30	9901 4921	6 153 2 068

NEW YORK STATE SURVEY.—PRELIMINARY GEOGRAPHICAL POSITIONS—(Continued).  
MONTGOMERY COUNTY—(Continued).

NAME OF STATION.	No. of man- ment.	Township.	No. of lot.	Owner's name.	Latitude.	Longi- tude.	Azimuth.	To station.	Back Azimuth.	DISTANCE.	
										Me- ters.	Miles.
Glen .....	30	Glen .....	....	L. Clement.....	43 53 21	74 19 27	229 00 27 143 56 28	Galway .....	49 11 56	30291	18.823
Oak Ridge.....	23	Charleston .....	....	Thomas Newman....	42 47 27	74 19 21	305 21 13 216 25 04	Helderberg .....	125 33 54	32376	16.763
Romeyn .....	Pot.	Amsterdam .....	....	Thomas Romeyn....	43 54 41	74 05 12	.....	Waterstreet .....	36 36 29	31334	19.471
Amsterdam Academy .....	.....	Amsterdam .....	....	.....	43 56 38	74 11 29	.....	Dougall .....	166 12 17	83286	23.791
Amsterdam R. C. church sp..	.....	Amsterdam .....	....	.....	42 56 06	74 11 18	.....	Waterstreet .....	225 41 56	5407	3.416
Charleston Four Cor. ch. twr.	.....	Charleston .....	....	.....	42 48 50	74 24 46	.....	Babcock .....	131 50 42	4118	2.569
Glen Dutch Ref. church sp..	.....	Glen .....	....	.....	42 53 40	74 20 33	.....	East Hill .....	181 50 42	13290	8.921
Sootch U. Presb church sp..	.....	Florida.....	....	.....	43 52 17	74 08 10	.....	Royal Hill.....	241 13 15	12345	7.671
ONEIDA COUNTY.											
FLORENCE .....	122	Florence .....	105	John Miller .....	43 23 15	75 39 43	50 03 43 27 40 23	Howlett Hill .....	129 39 23	12189	7.574
STARRE HILL.....	127	Steuben .....	100	James E. Davis.....	43 20 43	75 15 06	47 37 39 72 49 53	Bulger .....	149 48 50	93799	14.745
TASSEL HILL.....	29	Marshall .....	....	Lamanzo Leonard...	42 56 27	75 19 02	255 17 06 255 53 06	Vienna .....	261 20 51	24121	14.988
Prospect .....	117	Kirkland .....	....	John Neal.....	43 02 16	75 36 47	98 48 06 140 33 33	Royal Hill.....	826 43 42	26338	15.928
								Waterstreet .....	111 46 16	1601	0.896
								Van Allen .....	99 46 31	5417	3.268
									71 09 10	11390	7.069
									239 37 49	67089	41.675
									207 29 43	45563	28.313
									927 20 33	45950	28.523
									252 32 10	86552	52.712
									109 49 07	53123	33.010
									76 25 46	67001	41.683
									279 39 02	18354	11.406
									990 38 59	80134	18.725

Rome .....	142	Rome .....	2	John Newhouse.....	43 14 03	75 28 05	38 17 53	Fenner.....	216 06 31	38204	23 789
Vienna.....	186	Vienna.....	57	Milo Ingraham.....	43 14 50	75 40 54	34 48 45	Vienna.....	271 80 58	17417	10 822
Churchville Ger. Luth. ch....		Verona.....			43 11 27	75 34 28	38 16 24	Eagle.....	218 06 34	31857	19 609
Durhamville Baptist church...		Verona.....			43 07 06	75 40 17	9 07 07	Fenner.....	189 04 21	32678	20 306
Durhamville Ger. Cath. ch....		Verona.....			43 07 10	75 40 14	38 47 27	Vienna.....	305 37 00	10717	6 660
Fish Creek Union church....		Vienna.....			43 13 13	75 42 08	357 43 34	Bulger.....	208 43 36	10856	9 871
Higginsville Presb. church....		Verona.....			43 10 35	75 38 47	195 41 24	Canastota.....	928 00 28	7614	4 731
Rome Baptist church.....		Vienna.....			43 12 59	75 27 40	47 37 36	Canastota.....	177 42 40	6890	3 641
Rome First M. E. church.....		Rome.....			43 12 59	75 27 40	351 15 30	Bulger.....	287 34 43	7731	4 904
Rome German Catholic ch....		Rome.....			43 12 59	75 27 37	358 13 14	Vienna.....	178 13 20	6880	3 716
Rome Presbyterian church....		Rome.....			43 12 59	75 27 40	207 28 07	Bulger.....	27 28 55	3376	2 097
Vernon Baptist church.....		Vernon.....			43 12 59	75 27 37	100 00 32	Vienna.....	171 16 50	17379	10 799
Vernon Presbyterian church...		Vernon.....			43 12 59	75 27 37	8 16 35	Bulger.....	339 59 05	8370	5 901
Vernon Unitarian church.....		Vernon.....			43 12 59	75 27 40	100 53 07	Vienna.....	188 15 41	13437	7 728
Verona M. E. church.....		Verona.....			43 12 59	75 27 40	45 16 24	Bulger.....	290 44 03	19245	11 387
Verona Presbyterian church...		Verona.....			43 12 59	75 27 37	45 48 14	Vienna.....	226 07 53	23774	14 773
Vienna M. E. church.....		Vienna.....			43 12 59	75 27 37	100 49 17	Bulger.....	290 40 11	18297	11 370
		Vienna.....			43 12 59	75 27 40	45 20 56	Vienna.....	226 12 24	28330	14 301
		Vienna.....			43 12 59	75 27 40	45 48 14	Bulger.....	281 44 19	18298	11 357
		Vienna.....			43 12 59	75 27 37	45 48 14	Bulger.....	226 39 41	33336	14 634
		Vienna.....			43 12 59	75 27 37	45 48 14	Vienna.....	281 26 28	18519	11 507
		Vienna.....			43 12 59	75 27 37	45 48 14	Bulger.....	226 59 58	23783	14 747
		Vienna.....			43 12 59	75 27 37	45 48 14	Vienna.....	328 53 37	21711	13 491
		Vienna.....			43 12 59	75 27 37	45 48 14	Bulger.....	261 06 56	10265	6 379
		Vienna.....			43 12 59	75 27 37	45 48 14	Vienna.....	329 22 34	21481	13 584
		Vienna.....			43 12 59	75 27 37	45 48 14	Bulger.....	329 17 55	10149	6 306
		Vienna.....			43 12 59	75 27 37	45 48 14	Vienna.....	328 45 54	21783	13 536
		Vienna.....			43 12 59	75 27 37	45 48 14	Bulger.....	261 26 18	10315	6 409
		Vienna.....			43 12 59	75 27 37	45 48 14	Vienna.....	324 14 28	15142	9 409
		Vienna.....			43 12 59	75 27 37	45 48 14	Bulger.....	324 35 08	11069	6 878
		Vienna.....			43 12 59	75 27 37	45 48 14	Vienna.....	328 43 24	14067	9 356
		Vienna.....			43 12 59	75 27 37	45 48 14	Bulger.....	294 15 48	11218	6 971
		Vienna.....			43 12 59	75 27 37	45 48 14	Vienna.....	64 58 36	2057	1 278
		Vienna.....			43 12 59	75 27 37	45 48 14	Bulger.....	171 20 16	18526	12 132



## NEW YORK STATE SURVEY.—PRELIMINARY GEOGRAPHICAL POSITIONS—(Continued).

## ONONDAGA COUNTY.

NAME OF STATION.	No. of monument.	Township.	No. of lot.	Owner's name.	Latitude.	Longitude.	Azimuth.	To station.	Back Azimuth.	DISTANCE.	
										Me- ters.	Miles.
HOWLETT HILL.....	109	Marcellus.....	17	C. P. Cornish.....	43 59 53	76 17 23	37 25 49 133 45 43	Clyde..... Victory.....	277 02 21 318 52 53	47079 86457	29.264 23.061
RIPLEY HILL.....	106	Spafford.....	32	Abram Craig.....	43 47 26	76 14 33	169 53 29 93 37 10	Howlett Hill..... Niles.....	349 56 36 278 29 17	23444 16874	14.567 9.864
FABIUS .....	125	Fabius.....	24	Erasmus Fellows.....	43 43 42	76 01 22	133 18 53 199 15 47	Howlett Hill..... Eagle.....	313 07 54 19 19 55	30250 24956	18.737 16.596
Clapp .....	131	Pompey.....	5	Edmund O. Clapp.....	43 53 13	76 04 26	98 43 53 151 06 36	Howlett Hill..... Gilbertsville.....	278 32 24 330 56 00	20785 43405	12.921 26.971
Chestnut Ridge.....	111	Salina.....	110	H. L. Holly.....	43 05 49	76 11 21	37 30 33 230 18 16	Howlett Hill..... Eagle.....	217 26 24 110 29 14	13831 23771	8.594 14.456
Cossitt.....	119	Onondaga.....	113	D. Cossitt.....	43 00 02	76 11 42	37 59 06 124 27 44	Howlett Hill..... Chestnut Ridge.....	297 55 07 2 27 58	7966 10701	4.850 6.600
Carpenter.....	105	Onondaga.....	96	Charles Carpenter.....	43 00 34	76 17 12	20 47 45 277 25 43	Howlett Hill..... Cossitt.....	200 47 31 37 29 34	1352 7644	0.840 4.083
Collamer.....	144	De Witt.....	12	John I. Furbeck.....	43 06 05	76 03 35	353 49 33 307 20 22	Clapp..... Eagle.....	178 50 21 137 28 02	14631 11160	9.123 2.311
Davidson.....	128	Van Buren.....	42	E. Davidson.....	43 06 08	76 17 11	2 31 09 274 09 25	Howlett Hill..... Chestnut Ridge.....	182 30 54 94 13 24	11563 7991	7.187 4.223
Draper .....	100	Geddes.....	150	Dr. Draper.....	43 03 03	76 19 17	50 43 18 331 44 56	Howlett Hill..... Cossitt.....	230 39 42 171 45 22	9241 5628	5.743 3.497
Eagle .....	123	Manlius.....	79	Hezekiah Case.....	43 01 26	75 55 17	123 19 32 64 42 51	Gilbertsville..... Howlett Hill.....	318 03 02 264 27 39	44392 30385	27.546 13.631
Fairmount.....	103	Camillus.....	36	James Geddes.....	43 02 37	76 15 29	223 25 21 160 33 55	Chestnut Ridge..... Davidson.....	43 28 10 310 33 46	8166 6394	5.068 4.264

134	Green .....	De Witt .....	86	Ira Green.....	43 09 19	76 01 56	92 55 55 133 16 42	Howlett Hill..... Chestnut Ridge..	279 45 18 313 10 16	21959 17357	13 210 10 916
114	Giles .....	Skaneateles .....	66	W. F. Giles.....	43 03 03	76 36 20	223 15 85 308 38 08	Howlett Hill..... Niles.....	43 21 34 178 38 16	17416 9481	10 892 5 890
134	Hoxsie .....	Skaneateles .....	45	R. R. Hoxsie.....	43 55 46	76 23 35	221 63 44 18 89 44	Howlett Hill .....	41 57 10	10286	6 863
136	Kingsley .....	Van Buren.....	22	C. H. Kingsley .....	43 07 13	76 18 07	356 46 58 25 47 35	Howlett Hill..... Chestnut Ridge..	176 47 21 106 52 12	13697 9630	8 449 5 921
120	Kirkville .....	Manlius .....	38	George Brown.....	43 04 20	75 56 23	35 56 45 344 38 26	Clapp..... Eagle.....	215 62 37 164 34 10	14008 5660	8 704 3 455
140	Munn Davis.....	Lysander.....	81	L. F. Cuddeback.....	43 09 48	76 18 51	305 53 35 311 31 54	Chestnut Ridge .....	126 58 42 161 83 02	12951 7156	7 789 4 446
133	Northrup .....	Marcellus.....	6	J. G. Northrup & Son,	43 00 04	76 21 32	158 01 03 232 20 19	Gilbertville..... Chestnut Ridge..	8 06 30 52 27 16	84981 17444	21 693 10 833
101	Olympus.....	Syracuse .....	187	Lucy Raynor.....	43 02 05	76 08 02	146 57 41 63 52 15	Chestnut Ridge.....	326 55 25 232 49 45	8263 6237	5 134 3 876
137	Seeley .....	Skaneateles .....	22	M. Seeley.....	42 58 34	76 22 18	249 10 20 15 00 57	Howlett Hill..... Niles .....	69 13 34 194 68 20	6910 20389	4 294 12 639
104	Sherwood .....	Camillus.....	48	Matthew Sherwood..	43 02 14	76 17 24	230 58 01 182 21 06	Chestnut Ridge..	51 02 06 2 21 15	10532 7286	6 537 8 639
110	Sorrell Hill.....	Van Buren.....	20	J. Sears.....	43 06 52	76 21 30	337 25 26 277 57 59	Howlett Hill..... Chestnut Ridge..	157 28 07 98 04 56	13988 13903	8 691 8 639
	Amboy Presb. ch. spire .....	Camillus.....			43 04 16	76 16 24	247 06 57 168 57 32	Chestnut Ridge .....	67 10 23 342 66 69	7423 3621	4 613 2 260
	Brewerton ch., West spire .....	Cicero .....			43 14 17	76 08 33	192 55 56 344 23 40	Gilbertville.....	302 49 28 164 26 51	13137 80886	8 400 19 198
	Brayton's barn (cup. W. w'g). .....	De Witt .....	30	W. C. Brayton .....	43 04 15	76 04 54	49 55 43 343 18 26	Cossitt .....	229 51 05 153 20 06	19076 11676	7 504 7 265
	Collamer M. E. ch. ....	De Witt .....			43 06 15	76 04 00	351 49 28 42 16 00	Clapp.....	171 50 33	15066	9 361
	Fayetteville Cath. ch. ....	Manlius .....			43 01 47	76 00 22	276 25 04 22 44 22	Eagle.....	92 28 23 293 42 53	6845 7266	4 315 4 477
	Fayetteville P. E. ch. ....	Manlius .....			43 01 46	76 00 33	274 54 08 21 21 13	Eagle..... Clapp.....	84 57 43 201 19 54	7145 7066	4 439 4 408

NEW YORK STATE SURVEY.—PRELIMINARY GEOGRAPHICAL POSITIONS—(Continued).  
 ONONDAGA COUNTY—(Continued).

NAME OF STATION.	No. of monu- ment.	Township.	No. of lot.	Owner's name.	Latitude.	Longi- tude.	Azimuth.	To station.	Back Azimuth.	DISTANCE.	
										Me- tern.	Miles.
Fayetteville Presb. ch.....	.....	Manlius.....	....	.....	43 01 46	76 00 84	274 48 40 31 08 31	Eagle..... Clapp.....	" " " "	7186 7064	4.465 4.399
Geddes M. E. ch.....	.....	Geddes.....	....	.....	43 08 07	76 11 31	3 31 42 306 28 29	Cossitt..... Clapp.....	133 31 25 136 29 51	5714 15340	3.550 9.533
Kirkville M. E. ch.....	.....	Manlius.....	....	.....	43 04 31	75 57 11	335 41 01 287 49 31	Eagle..... Kirkville.....	155 42 19 107 50 04	6369 11155	3.895 7.180
Liverpool M. E. ch. spire....	.....	Salina.....	....	.....	43 06 14	76 19 33	354 23 10 296 00 11	Cossitt..... Chestnut Ridge..	174 23 44 116 00 59	11520 1763	7.128 1.096
Manlius Station M. E. ch.....	.....	Manlius.....	....	.....	43 04 43	76 00 03	313 09 13 15 06 30	Eagle..... Clapp.....	133 13 37 185 04 32	8843 13467	5.494 7.747
North Manlius P. O. Bapt. ch.	.....	Manlius.....	....	.....	43 05 58	76 58 29	30 28 45 91 48 06	Clapp..... Collamer.....	200 26 03 271 44 39	19349 9838	9.538 4.311
North Manlius P. O. M. E. ch.	.....	Manlius.....	....	.....	43 06 02	75 58 37	30 57 15 90 57 16	Clapp..... Collamer.....	200 24 33 270 53 45	15456 6966	9.604 4.829
Onondaga Hill Presb. ch.....	.....	Onondaga.....	....	.....	43 00 13	76 11 06	67 33 56 178 16 49	Cossitt..... Chestnut Ridge..	247 32 33 258 16 40	886 10377	0.519 6.448
Pompey Hill Cath. ch.....	.....	Pompey.....	....	.....	43 54 04	76 00 55	309 13 36 354 14 30	Eagle..... Fenner.....	29 17 16 74 25 23	16644 52396	9.731 14.327
Pompey Hill Presb. ch.....	.....	Pompey.....	....	.....	43 53 59	76 01 04	309 37 43 254 03 29	Eagle..... Fenner.....	29 41 45 74 13 38	16989 52135	9.890 14.376
Silver Street or St. Mary's ch. Syracuse.	.....	Manlius.....	....	.....	43 05 16	76 00 15	316 34 51 288 07 15	Eagle..... Kirkville.....	136 28 14 108 09 53	9770 5535	6.071 3.433
First Presb. church spire.....	.....	Syracuse.....	....	.....	43 02 55	76 09 15	31 59 40 161 56 37	Cossitt..... Chestnut.....	311 53 00 331 55 10	6277 9638	3.900 3.780

St. John's R. C. ch. spire.....	Syracuse .....	.....	43 04 07	76 09 36	20 45 83 109 55 22	Cosalt..... Davison.....	200 44 12 280 50 11	8070 10661	5,014 6,805
St. Lucy's R. C. ch. spire.....	Syracuse .....	.....	43 03 37	76 09 52	27 35 53 161 13 00	Cosalt..... Chestnut Ridge..	207 84 18 841 10 59	5354 6273	3,333 5,387
<b>OSWEGO COUNTY.</b>									
AMBOY .....	Amboy .....	94	D Black.....	43 23 15	75 55 14	74 50 03 0 06 23	Gilbertsville..... Eagle.....	31804 46374	19,763 25,083
GILBERTSVILLE.....	Schroeppe.....	27	Elias Thomas.....	43 18 43	76 17 56	67 40 53 359 08 26	Victory..... Howlett Hill.....	27 28 15 179 08 43	16,895 21,653
Cleveland P. E. ch.....	Constantia.....	.....	.....	43 14 03	75 53 01	7 31 32 333 44 23	Eagle..... Crauson.....	187 29 59 158 49 05	23544 25763
Constantia Presb. ch.....	Constantia.....	.....	.....	43 14 57	76 09 16	344 53 07 5 24 44	Eagle..... Clapp.....	164 55 31 185 23 15	25906 31135
Central Square ch. spire.....	Hastings.....	.....	.....	43 17 14	76 08 53	337 43 31 6 52 07	Eagle..... Cosalt.....	147 53 49 186 50 11	21,475 19,919
Falley Academy, Fulton.....	Volney.....	.....	.....	43 19 19	76 34 48	376 53 59 333 27 45	Gilbertsville..... Cosalt.....	96 58 43 153 36 43	5,812 36,775

## OSWEGO COUNTY.

EAST HILL.....	Cherry Valley.....	26	Albert Stiles.....	43 46 53	74 43 16	239 15 43 296 33 43	Galway..... Helderberg.....	59 42 44 107 01 56	62331 56343
Richfield Springs Obs'y.....	Richfield .....	.....	.....	43 50 31	74 57 00	232 16 15 288 23 12	Royal Hill..... East Hill.....	53 35 53 108 36 13	44329 21184

## RENSSELAER COUNTY.

BAFESQUE.....	Brunswick.....	U.S.C.S.	J. H. Hayner.....	42 47 20	73 36 59	61 03 53	Helderberg.....	240 47 50	36966
YELLOW PINE.....	Schedack.....	U.S.C.S.	N. Featherley.....	42 29 27	73 40 28	182 07 41	Hallenbeck (C. S.)	2 07 54	11964
YELLOW PINE.....	Schedack.....	150	N. Featherley.....	42 29 29	73 40 27	26 21 29	Yellow Pine(C.S.)	206 21 28	50
Bolvedere.....	East Greenbush.....	.....	.....	42 35 53	73 44 19	357 46 37 298 53 34	Van Denb'gh (b't) Grandview.....	177 46 43 86 52 18	5067 0,304
Campbell's Island.....	Schedack.....	163	On Campbell's Island	42 33 16	73 45 06	280 43 18 183 49 34	Van Denb'gh (b't) Muller.....	100 48 53 3 49 37	1291 1,132

NEW YORK STATE SURVEY.—PRELIMINARY GEOGRAPHICAL POSITIONS—(Continued).  
 RENSSELAER COUNTY—(Continued).

NAME OF STATION.	No. of monument.	Township.	No. of lot.	Owner's name.	Latitude.	Longitude.	Azimuth.	To station.	Back Azimuth.	DISTANCE.	
										Meters.	Miles.
Castleton.....	167	Schodack.....	....	Roadside.....	42 32 10	73 45 15	113 09 16 55 48 43	Vanderzee (bolt), Baker.....	238 08 29 235 48 12	1719 1268	1.068 0.768
Clapper.....	161	Schodack.....	....	B. Clapper.....	42 30 58	73 45 44	72 00 11 161 55 23	Vrooman..... Vanderzee (bolt),	251 59 24 341 54 56	1639 3098	1.049 1.881
Cooper.....	164	East Greenbush.....	....	S. end of Papsancee I.	42 35 09	73 45 14	142 19 13 22 36 30	Parke..... Van Wie.....	322 18 83 202 36 24	1910 581	1.198 0.380
Denison.....	168	East Greenbush.....	....	Burton H. Denison..	42 36 49	73 45 22	293 02 39 154 43 22	Teller..... Westorio Island.	118 03 30 334 42 09	1882 1021	1.169 0.684
Grandview.....	149	East Greenbush.....	....	Roadside.....	42 35 54	73 43 57	299 47 54 3 16 03	Hallenbeck (C. S.), Van Denb'h (b't),	89 50 29 183 15 54	5210 5118	3.268 3.180
Hallenbeck.....	U. S. C. S.	East Greenbush.....	....	Daniel Hallenbeck...	42 35 54	73 40 09	9 07 54	Yellow Pine (C. S.),	188 07 41	11064	7.433
Hallenbeck.....	151	East Greenbush.....	....	Daniel Hallenbeck...	42 35 55	73 40 09	308 18	Hallenbeck (C. S.),	198 08	1	0.001
Moles.....	153	East Greenbush.....	....	Marcus Moles.....	42 37 42	73 45 03	47 39 36 331 15 02	Corning..... Teller.....	227 31 47 151 15 41	2232 2705	1.337 1.681
Muller.....	159	Schodack.....	....	P. L. Muller.....	42 34 15	73 45 01	295 07 33 330 41 18	Grandview..... Van Denb'h (b't),	25 08 15 150 41 52	3337 2843	2.104 1.456
Mull's Island.....	175	Schodack.....	....	On Mull's Island.....	42 28 25	73 47 05	160 31 49 24 56 25	Rohn Hook..... Orchard.....	340 21 36 204 33 24	1298 1656	0.507 1.029
Mull's Plat.....	173	Schodack.....	....	On Mull's Plat.....	42 29 16	73 47 01	175 47 10 55 18 25	Mull..... Rohn Hook.....	355 47 07 235 13 09	1142 649	0.710 0.408
Papsancee Island.....	153	East Greenbush.....	....	On Papsancee Island,	42 35 53	73 45 30	243 02 25 185 55 04	Teller..... Denison.....	68 03 22 6 53 09	2142 1717	1.331 1.067

Rysedorph.....	U.S.C.S.	East Greenbush.....	.....	William Rysedorph..	42 37 35	73 43 11	306 40 45	126 49 48	3 224
Rysedorph.....	2	East Greenbush..	.....	William Rysedorph..	42 37 35	73 43 12	9 15 52	189 16 13	5 180
Schodack Island.....	172	Schodack .....	.....	On Island.....	42 30 25	73 46 22	44 40 53	141 41	0 001
Teller .....	148	East Greenbush..	.....	Jacob V. B. Teller...	42 36 25	73 44 06	293 55 24	224 40 24	0 885
Ten Eyok.....	U.S.C.S.	Schodack .....	.....	C. H. Lent.....	42 28 46	73 45 50	270 43 49	111 51 10	0 637
Ten Eyok.....	183	Schodack.....	.....	C. H. Lent.....	42 28 46	73 45 50	185 01 43	29 58 01	1 556
Traver .....	U.S.C.S.	Schodack.....	.....	R. S. Van Denburgh.	42 30 13	73 45 40	200 44 21	59 46 30	3 411
Traver .....	152	Schodack.....	.....	R. S. Van Denburgh.	42 30 13	73 45 40	91 24	5 01 50	1 667
Van Denburgh.....	Bolt.	Schodack.....	.....	Ed. B. Van Denburgh.	42 33 08	73 44 10	323 25 33	255 06	0 001
Van Denburgh.....	153	Schodack .....	.....	Ed. B. Van Denburgh.	42 33 07	73 44 10	227 00 51	101 17 53	4 509
Castleton D. R. ch.....	.....	Schodack.....	.....	.....	42 31 56	73 45 23	42 10 57	20 45 23	3 686
Coeymans Dike Light-house.	.....	Schodack.....	.....	.....	42 28 29	73 47 05	23 05 05	371 24	0 001
Cow Island Light-house.....	.....	Schodack.....	.....	.....	42 32 15	73 45 21	316 29 15	143 28 03	5 283
East Greenbush D. R. ch.....	.....	East Greenbush..	.....	.....	42 35 17	73 42 01	109 51 58	47 03 34	4 673
East Greenbush M. E. ch.....	.....	East Greenbush..	.....	.....	42 35 15	73 41 53	36 17 43	5 43 23	0 022
Greenbush Presb. ch.....	.....	East Greenbush..	.....	.....	42 38 09	73 44 57	159 26 34	289 51 15	0 956
Nine Mile Tree Light-house..	.....	Schodack.....	.....	.....	42 31 04	73 45 54	113 27 06	216 16 40	2 218
							114 05 25	339 25 47	2 851
							158 51 54	293 23 47	1 795
							113 27 06	294 04 04	2 888
							340 07 41	294 04 04	1 855
							63 13 25	217 06 47	1 886
							103 43 11	160 03 16	2 129
								243 12 44	0 949
								313 42 07	0 299

NEW YORK STATE SURVEY.—PRELIMINARY GEOGRAPHICAL POSITIONS—(Continued).  
 RENSSELAER COUNTY—(Continued).

NAME OF STATION.	No. of monument.	Township.	No. of lot.	Owner's name.	Latitude.	Longitude.	Azimuth.	To station.	Back Azimuth.	DISTANCE.	
										Me- ters.	Miles.
Olcott's house, cupola of .....	.....	East Greenbush..	....	.....	42 37 51	73 43 14	354 14 45 310 33 08	Ryesdorph (C.S.) Hallenbeck (C.S.)	" " 130 35 11	507 5543	0 315 3.444
Roman Catholic ch. spire ....	.....	Troy.....	....	.....	42 42 03	73 41 49	.....	Ferris Ryesdorph .....	239 24 33 192 45 03	5410 8479	3 393 5.398
Schodack chan'l Light-house,	.....	Schodack.....	....	.....	42 29 50	73 43 42	243 33 33 328 59 38	Traver (U.S.C.S.) Ten Eyck (C.S.)	63 39 05 149 00 13	1583 2297	0 993 1.428
Schodack Landing, flag pole on Knickerbocker ice-house	.....	Schodack.....	....	.....	42 28 23	73 45 27	47 17 01 131 00 55	Orchard..... Rohan Hook.....	227 16 15 314 00 16	2148 1585	1.331 1.140
Schodack Landing D. R. ch. ....	.....	Schodack.....	....	.....	42 28 48	73 45 14	198 10 44 274 13 28	Traver (U.S.C.S.) Ten Eyck (C.S.)	16 11 06 94 13 41	2741 530	1.704 0.330
Troy University (N. W. sp.)..	.....	Troy.....	....	.....	42 43 43	73 41 00	.....	Ryesdorph .....	194 45 24 224 42 52	11734 8905	7.291 5.099

## SARATOGA COUNTY.

GALWAY .....	17	Galway .....	....	Sarah Ingerson.....	43 04 04	74 02 36	359 53 02 311 29 39	Helderberg .....	176 54 22 131 47 26	49021 46633	30 461 28.979
Ambler .....	16	Greenfield.....	....	Charles E. Ambler..	43 05 35	73 51 09	79 47 29 30 39 48	Galway..... Van Allen.....	259 39 40 210 33 35	15789 24327	9 810 15.116
Bailey.....	19	Saratoga .....	....	James Bailey.....	43 04 08	73 39 18	.....	Galway .....	298 37 00 210 31 47	31629 57067	19 653 35.452
Ballston.....	20	Ballston.....	....	Village lot.....	43 00 48	73 51 03	324 25 50 46 06 24	Radesque .....	142 35 25 226 00 07	31447 17414	19 540 10.890
Knox.....	Pot.	Galway.....	....	Wm. Knox.....	42 59 07	74 05 49	.....	Waterstreet.....	171 07 37 160 52 36	15735 11310	8 535 7.097
Saratoga.....	21	Saratoga Springs.	....	Village lot.....	43 04 06	73 47 23	43 58 57 89 54 29	Van Allen..... Galway .....	223 50 11 269 44 06	25242 26648	15 935 12.880

Burnt Hills Baptist church..	Ballston .....	42 54 24	73 53 43	251 11 12	Waterfront.....	15017	9.331
Burnt Hills Christian church.	Ballston .....	42 54 34	73 53 32	268 27 32	Van Atten.....	8904	5.473
Vlacher's Ferry church spire.	Clifton Park.....	43 47 46	73 49 36	211 08 43	Van Atten.....	9184	5.707
Galway P. O., Presb. ch. sp.	Galway.....	43 01 05	74 01 54	227 11	Stille's Hill.....	2711	14.112
<i>Saratoga Springs.</i>					Niskayuna .....	3337	2.074
Roman Catholic church sp...	Saratoga Springs.	43 04 34	73 47 15	124 16 41	Freleigh.....	3945	2.461
Methodist Episcopal ch. sp...	Saratoga Springs.	43 04 48	73 47 16	350 13 33	Galway.....	5598	3.478
Presbyterian church spire...	Saratoga Springs.	43 05 01	73 47 04	190 28 45	Waters .....	17493	10.369
					Saratoga .....	863	0.554
					Ambler.....	5623	3.494
					Saratoga .....	1304	0.810
					Ambler.....	5461	3.394
					Saratoga .....	1756	1.091
					Ambler.....	5635	3.503

## SCHENECTADY COUNTY.

Barret.....	Duanesburgh.....	42 43 00	74 11 02	305 56 39	Oak Ridge.....	14023	8.712
Burnt Hills.....	Glenville.....	42 54 34	73 54 17	338 33 54	Chapman.....	9060	5.319
Chapman .....	Duanesburgh .....	42 47 18	74 13 19	268 07 17	Van Atten.....	8167	5.074
Conover.....	Esperance .....	42 46 57	74 17 27	203 53 30	Stille's Hill.....	22305	13.797
Princeton.....	Princeton.....	42 50 45	74 05 43	191 43 49	Babcock .....	14051	11.216
Bexford Flats.....	Glenville.....	42 51 22	73 53 51	271 49 58	Oak Ridge.....	9321	5.108
Sears.....	Duanesburgh .....	42 43 43	74 14 45	53 31 24	Chapman.....	5677	3.527
Van Atten.....	Glenville.....	42 54 17	74 00 16	191 36 39	Manu.....	11140	6.952
					Rhinesque.....	39776	24.716
					Heiderberg .....	25254	15.717
					Van Atten.....	10277	6.386
					Stille's Hill.....	17621	10.360
					Oak Ridge.....	4638	5.303
					Chapman .....	6923	4.303
					Heiderberg .....	30633	19.158
					Rhinesque .....	34298	21.269



NEW YORK STATE SURVEY.—PRELIMINARY GEOGRAPHICAL POSITIONS—(Continued).  
SCHENECTADY COUNTY—(Continued).

NAME OF STATION.	No. of monument.	Township.	No. of lot.	Owner's name.	Latitude.	Longitude.	Azimuth.	To station.	Back Azimuth.	DISTANCE.	
										Me- ters.	Miles.
Waterstreet.....	33	Rotterdam	....	John D. Waterstreet.	42 51 48	74 04 15	98 01 10 185 36 18	Glen..... Galway.....	277 50 50 5 37 28	20898 22826	12.986 14.154
Braman's Corners Un. ch. sp.	.....	Duanesburgh	....	.....	42 47 44	74 15 13	.....	Conover..... Glen.....	244 45 19 331 02 23	3371 11898	2.095 7.898
Braman's Corners Bap. ch. sp.	.....	Duanesburgh	....	.....	42 47 49	74 15 05	.....	Conover..... Glen.....	243 36 49 329 02 08	3909 11844	9.243 7.860
Duanesburgh church tower..	.....	Duanesburgh	....	.....	42 46 10	74 09 25	.....	Babcock..... Helderberg.....	209 57 08 143 55 55	17992 18447	11.184 12.332
Scotia Baptist church spire..	.....	Glenville	....	.....	42 49 33	73 57 49	.....	Van Aatten..... Stille's Hill.....	339 07 35 210 17 59	9363 11738	5.931 7.263
Scotia D. R. church tower...	.....	Glenville	....	.....	42 49 39	73 57 38	.....	Van Aatten..... Stille's Hill.....	337 13 23 210 57 17	9801 13025	5.780 7.473
Princeton Presb. church sp.	.....	Princeton	....	.....	42 48 25	74 04 47	.....	Helderberg..... Stille's Hill.....	164 15 10 156 08 28	20767 8793	12.904 5.465
Poentieskill D. R. church....	.....	Rotterdam	....	.....	42 43 29	73 59 47	.....	Van Aatten..... Stille's Hill.....	356 28 17 201 41 38	10713 8775	6.682 5.453
D. R. ch. west of Dunnsville.	.....	Rotterdam	....	.....	42 45 07	74 02 44	.....	Stille's Hill..... Smith.....	158 10 47 261 43 33	3085 2907	1.295 1.638
Rotterdam M. E. church.....	.....	Rotterdam	....	.....	42 46 46	73 57 30	.....	Van Aatten..... Stille's Hill.....	344 50 42 231 53 00	14405 8674	8.951 5.017
<i>Schenectady.</i>											
Armory flag pole.....	.....	Schenectady	....	.....	42 48 35	73 53 20	.....	Stille's Hill..... Van Aatten.....	223 36 09 332 57 07	11543 11892	7.173 7.846

[illegible]

**SCHOHARIE COUNTY.**

Argusville .....	Carlsle .....	Henry C. Lycker ....	42 47 48	74 31 13	343 09 14	Baracourle.....	163 10 26	8300	5 194
Babcock ....	Middleburgh. ....	Wm. Babcock .....	42 37 45	74 16 01	270 33 31	Heiderberg .....	90 43 55	20968	13 048
Baracourle .....	Carlsle.....	Frank Schultz .....	42 43 29	74 29 27	200 28 49	Galway .....	20 37 56	53025	23 337
Bouck .....	Middleburgh.....	Joseph Mann.....	42 37 47	74 18 52	97 43 16	Summit .....	207 39 30	16301	10 129
Dockstader.....	Sharon .....	Ephraim Dockstader.....	43 45 24	74 40 09	109 53 17	East Hill.....	289 44 36	18576	11 543
Holmes.....	Richmondville.....	Harvey Holmes ....	43 37 34	74 30 51	.....	Mann .....	357 05 11	6079	3 777
Kelsey .....	Middleburgh.....	Wm. Kelsey.....	43 37 31	74 21 56	53 25 02	Kelsey .....	263 17 30	4199	2 609
Mann.....	Schoharie.....	Wm. Mann .....	43 41 03	74 19 06	137 56 43	Summit .....	138 39 14	14903	11 393
Sterling.....	Sharon .....	Chas. Sterling.....	42 43 41	74 33 27	296 50 26	Holmes.....	138 48 06	19262	11 369
					210 27 37	Summit .....	238 22 13	6653	4 140
					.....	East Hill.....	317 49 04	23241	14 443
					.....	Babcock .....	86 54 29	8067	5 031
					.....	Mann .....	30 29 22	7611	4 730
					.....	Chapman .....	31 21 14	13901	8 694
					.....	Babcock .....	145 25 05	7133	4 619
					.....	Baracourle.....	150 25 32	11060	6 873
					.....	East Hill.....	254 19 37	13455	7 739

NEW YORK STATE SURVEY.—PRELIMINARY GEOGRAPHICAL POSITIONS—(Continued).  
SCHOHARIE COUNTY—(Continued).

NAME OF STATION.	No. of monument.	Township.	No. of lots.	Owner's name.	Latitude	Longitude.	Azimuth.	To station.	Back Azimuth.	DISTANCE.	
										Me- ters.	Miles.
Summit.....	25	Summit.....	....	Jehn B. Wharton....	42 35 41	74 35 00	" " " 224 23 41 154 27 49	Oak Ridge..... Oak Hill.....	" " " 44 34 13 834 22 53	30489 22884	18 951 14 263
Thompson.....	.....	Richmondville....	....	N. C. Thompson.....	42 39 22	74 33 12	.....	Summit..... Holmes.....	209 20 35 150 48 09	7798 3787	4 815 2 353
Tilpauqh.....	Drilled hole.	Carlisle.....	....	Jacob Tilpauqh.....	42 48 18	74 27 32	83 09 28	East Hill.....	272 59 23	30108	12 404
Turk.....	41	Cobleskill.....	....	Felix Turk.....	42 39 56	74 28 09	49 58 07 123 49 19	Summit..... East Hill.....	229 53 28 303 39 45	12223 23158	7 595 14 390
Carlisle Presbyterian church.	.....	Carlisle.....	....	.....	42 45 22	74 26 46	.....	Sears..... Oak Ridge.....	100 41 00 69 15 08	16685 10817	10 363 6 733
Cobleskill (Hotel Augustan) ..	.....	Cobleskill.....	....	.....	42 40 40	74 29 07	.....	Summit..... Turk.....	221 04 19 185 35 43	12224 1880	7 596 1 108
Esperance Presb. church....	.....	Esperance.....	....	.....	42 45 43	74 15 41	.....	Chapman..... Sears.....	47 37 19 161 04 57	4350 3925	2 703 2 489
Esperance M. E. church.....	.....	Esperance.....	....	.....	42 45 38	74 15 30	.....	Chapman..... Sears.....	43 54 46 163 53 33	4292 3706	2 661 2 303
Sloansville Bap. ch. tower ..	.....	Esperance.....	....	.....	42 45 26	74 19 53	.....	Sears..... Babcock.....	114 17 00 199 38 33	7871 15126	4 787 9 399
Middleburgh M. E. church sp.	.....	Middleburgh.....	....	.....	42 35 47	74 20 00	.....	Mann..... Kelley.....	7 07 58 820 21 40	9928 4144	6 107 2 575
Middleburgh D. E. church sp.	.....	Middleburgh.....	....	.....	42 36 17	74 20 17	.....	Mann..... Kelley.....	10 22 44 315 28 47	8987 3199	5 584 1 988
Richmondville hotel flag pole.	.....	Richmondville....	....	.....	42 38 02	74 33 53	.....	Turk..... Summit.....	65 44 51 199 19 20	8392 4594	5 839 2 364

Schoharie Luth. church sp...	.....	Schoharie .....	.....	.....	.....	.....	.....	Mann .....	845 86 42	2393	1,494
Schoharie, Old Fort.....	.....	Schoharie .....	.....	.....	.....	.....	.....	Kelsey .....	925 34 37	6209	8,894
	.....		.....	.....	.....	.....	.....	Mann .....	801 57 20	1535	0,954
	.....		.....	.....	.....	.....	.....	Kelsey .....	931 54 54	7728	4,801

## WAYNE COUNTY.

Clyde .....	U.S.L.S. ....	Galen .....	.....	P. S. Sloan.....	43 03 05	76 51 56	228 22 08	Victory .....	48 39 42	29000	17,898
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## YATES COUNTY.

Milo .....	118	Milo .....	.....	B. L. Hoyt .....	43 35 17	77 01 54	194 43 21	Clyde ..	14 49 07	53250	83,088
	.....		.....		.....	.....	244 06 45	Niles ..	64 30 58	54131	33,485

## COUNTY LINE AN STATIONS AND MONUMENTS.

## ALBANY AND SCHENECTADY COUNTIES.

An Station, No. 43 .....	.....	Watervliet .....	.....	Henry Witbeck .....	43 46 33	73 47 59	83 54 53	An Station, No. 97, Niskayuna .....	963 53 54	1931	1,213
County line Monument .....	43	{ Watervliet .....	.....	Henry Witbeck .....	43 46 33	73 47 59	68 30 53	Niskayuna .....	248 29 33	2803	1,803
An Station, No. 97 .....	.....	Niskayuna .....	.....	Village lot .....	43 46 27	73 49 25	41 36 26	An Station, No. 43, Niskayuna .....	231 36 03	1145	0,713
County-line Monument .....	97	{ Watervliet .....	.....	In road, opposite T. J. Miller's store, .....	43 46 19	73 49 23	238 15	Freeligh .....	85 46 53	3009	1,870
An Station, No. 70 .....	.....	{ Niskayuna .....	.....	Richard Van Patten, .....	43 45 25	73 57 50	14 59 00	An Station, No. 97, Heiderberg .....	194 57 05	14953	9,272
County-line Monument .....	70	Rotterdam .....	.....	J. Sitterly .....	43 45 25	73 57 50	67 15 09	Sittie's Hill .....	247 13 13	5430	3,969
An Station, No. 74 .....	.....	{ Rotterdam .....	.....	Richard Van Patten .....	43 45 25	73 57 50	133 10	An Station, No. 70, Heiderberg .....	181 26 10	13771	8,537
County-line Monument .....	74	Guilderland .....	.....	Abraham Coes .....	43 45 04	74 00 24	53 54 00	Sittie's Hill .....	232 58 45	3024	1,879
An Station, No. 46 .....	.....	{ Guilderland .....	.....	J. Ostrander .....	43 45 04	74 00 24	381 40	An Station, No. 74, Sittie's Hill .....	96 27 37	5354	3,327
County-line Monument .....	46	Princetown .....	.....	Levi Van Anken .....	43 44 24	74 06 04	276 24 58	Smith .....	76 47 09	1733	1,108
	.....	Guilderland .....	.....	Wm. H. Furbeck ..	.....	.....	256 46 17				
	.....	{ Duaneburgh .....	.....	Levi Van Anken .....	43 44 24	74 06 04	90	An Station, No. 46, Sittie's Hill .....	270J	2	0,001
	.....	{ Duaneburgh .....	.....	Wm. H. Furbeck ..	.....	.....	.....				

**NEW YORK STATE SURVEY.—PRELIMINARY GEOGRAPHICAL POSITIONS—(Continued).**  
**ALBANY AND SCHENECTADY COUNTIES—(Continued).**

NAME OF STATION.	No. of monument	Township.	No. of lot.	Owner's name.	Latitude.	Longitude.	Azimuth.	To station.	Back Azimuth.	DISTANCE.	
										Me- ters.	Miles.
An Station, No. 44.....	.....	{ Knox .....	.....	Cornelia Ketchum.. }	42 43 54	74 10 15	268 10 30	Sittle's Hill .....	88 16 00	11029	6 854
County-line Monument..	44	{ Duaneburgh ... }	.....	John D. Westfall.. }	42 43 54	74 10 15	269 40 47	Smith .....	79 44 36	7561	4 693
		{ Knox .....	.....	Cornelia Ketchum.. }	42 43 54	74 10 15	270	An Station, No. 44.. }	90	2	0 001
		{ Duaneburgh ... }	.....	John D. Westfall.. }	42 43 54	74 10 15	270				
<b>SCHOHARIE AND SCHENECTADY COUNTIES.</b>											
An Station, No. 53.....	.....	{ Schoharie .....	.....	John W. Barton.... }	42 42 59	74 14 30	.....	Sears .....	346 22 04	1385	0 867
County-line Monument.....	53	{ Wright .....	.....	John W. Barton.... }	42 42 59	74 14 30	.....	Chapman.....	11 24 02	8162	5 072
		{ Duaneburgh... }	.....	John W. Barton.... }	42 42 59	74 14 30	.....				
		{ Schoharie .....	.....	John W. Barton.... }	42 42 59	74 14 30	.....				
		{ Wright .....	.....	John W. Barton.... }	42 42 59	74 14 30	.....				
		{ Duaneburgh... }	.....	John W. Barton.... }	42 42 59	74 14 30	.....				
<b>SCHENECTADY AND MONTGOMERY COUNTIES.</b>											
An Station, No. 53.....	.....	{ Duaneburgh ... }	.....	Samuel McMillan.. }	42 49 48	74 13 16	.....	Oak Ridge .....	248 18 42	9365	5 819
County-line Monument.....	53	{ Florida..... }	.....	Wm. J. Merry..... }	42 49 48	74 13 16	.....	Conover.....	227 23 24	7769	4 537
		{ Duaneburgh ... }	.....	Samuel McMillan.. }	42 49 48	74 13 16	.....				
		{ Florida..... }	.....	Wm. J. Merry..... }	42 49 48	74 13 16	.....				

## NEW YORK STATE SURVEY.—GEOGRAPHICAL POSITIONS—HUDSON RIVER—ALBANY TO NEW BALTIMORE.

NAME OF STATION.	Latitude.	Longitude.	Azimuth.	To station.	Back Azimuth.	DISTANCE.	
						Meters.	Miles.
YELLOW PINE (U. S. C. S.). . . . .	42 29 27.12	73 40 28.40	0 ' " 182 07 41	Hallenbeck (U. S. C. S.) ..	0 ' " 2 07 54	11964.3	7.433
Hallenbeck (U. S. C. S.) . . . . .	42 35 54.63	73 40 08.91					
YELLOW PINE (S. S. Mon. 150) . . . . .	42 29 28.56	73 40 27.44	26 21 29	YELLOW PINE (U. S. C. S.),	206 21 28	49.63	0.031
Hallenbeck (S. S. Mon. 151) . . . . .	42 35 54.65	73 40 08.95	308 03 48	Hallenbeck (U. S. C. S.) ..	128 08 48	1.052	0.001
Van Denburgh (copper bolt) . . . . .	42 33 08.50	73 44 10.28	323 25 32 237 00 51	YELLOW PINE (U. S. C. S.), Hallenbeck (U. S. C. S.)..	143 28 02 47 08 34	8502.6 7521.2	5.233 4.673
Van Denburgh (S. S. Mon. 153) . . . . .	42 33 07.33	73 44 10.44	185 48 22	Van Denburgh (cop'r bolt),	5 48 22	36.09	0.022
Traver (U. S. C. S.) . . . . .	42 30 13.09	73 45 40.12	231 14 28 200 44 21	YELLOW PINE (U. S. C. S.), Van Denburgh (bolt) .....	101 17 53 20 45 23	7253.9 5787.1	4.509 3.596
Traver (S. S. Mon. 152) . . . . .	42 30 13.09	73 45 40.06	91 24	Traver (U. S. C. S.) . . . . .	271 24	1.000	0.001
Rysedorph (U. S. C. S.) . . . . .	42 37 35.12	73 43 11.46	306 40 45 9 15 52	Hallenbeck (U. S. C. S.)... Van Denburgh (bolt).....	126 42 48 189 15 12	5188.4 8335.0	3.224 5.180
Rysedorph (S. S. Mon. 2) . . . . .	42 37 35.17	73 43 11.51	321 41	Rysedorph (U. S. C. S.)....	141 41	1.833	0.001

# NEW YORK STATE SURVEY.—GEOGRAPHICAL POSITIONS—HUDSON RIVER—ALBANY TO NEW BALTIMORE.

NAME OF STATION.	Latitude.	Longitude.	Azimuth.	To station.	Back Azimuth.	DISTANCE.	
						Meters.	Miles.
Grandview (S. S. Mon. 149) . . . . .	42 35 54.10 0   '   "	73 43 57.50 0   '   "	269 47 54 8 16 03 0   '   "	Hallenbeck (U. S. C. S.) . . Van Denburgh (bolt) . . . .	89 50 29 183 15 54 0   '   "	5210.5 5117.9	3.238 3.180
Teller (S. S. Mon. 148) . . . . .	42 36 24.77	73 44 06.29	209 55 24 273 43 49	Rysedorph (U. S. C. S.) . . Hallenbeck (U. S. C. S.) . .	29 56 01 99 46 30	2504.5 5490.0	1.556 3.411
Corning (S. S. Mon. 147) . . . . .	42 36 52.79	73 46 15.64	252 41 50 299 53 30	Rysedorph (U. S. C. S.) . . Grandview . . . . .	72 43 55 119 55 04	4395.4 3632.1	2.731 2.257
Parke (copper bolt) . . . . .	42 35 58.29	73 46 05.56	323 20 34 272 31 25	Van Denburgh (bolt) . . . . Grandview . . . . .	153 21 52 92 32 52	5861.4 2922.1	3.642 1.816
Belvedere . . . . .	42 35 53.24	73 44 18.93	357 46 37 266 52 34	Van Denburgh (bolt) . . . . Grandview . . . . .	177 46 43 86 52 48	5086.7 489.4	3.161 0.304
Van Wie (S. S. Mon. 146) . . . . .	42 34 53.42	73 45 23.31	154 18 11 218 28 56	Parke . . . . . Belvedere . . . . .	334 17 43 38 29 40	2221.5 2358.1	1.880 1.465
Vanderzee (copper bolt) . . . . .	42 32 31.53	73 46 24.77	249 35 39 346 34 35	Van Denburgh (bolt) . . . . Traver (U. S. C. S.) . . . . .	69 37 10 166 35 05	3273.3 4391.1	2.034 2.728
Vanderzee (S. S. Mon. 145) . . . . .	42 32 31.71	73 46 24.74	6 56 09	Vanderzee (copper bolt) . . . .	186 56 09	5.70	0.004
Vrooman (S. S. Mon. 154) . . . . .	42 30 41.31	73 46 53.95	219 25 08 297 18 44	Van Denburgh (bolt) . . . . Traver (U. S. C. S.) . . . . .	39 26 59 117 19 34	5879.7 1897.0	3.653 1.179
Shad Island (S. S. Mon. 171) . . . . .	42 30 52.12	73 46 23.24	320 44 00 64 33 33	Traver (U. S. C. S.) . . . . . Vrooman . . . . .	140 44 29 244 33 12	1555.3 770.4	0.966 0.482

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# NEW YORK STATE SURVEY.—GEOGRAPHICAL POSITIONS—HUDSON RIVER—ALBANY TO NEW BALTIMORE.

NAME OF STATION.	Latitude. ° ' "	Longitude. ° ' "	Azimuth. ° ' "	To station.	Back Azimuth. ° ' "	DISTANCE.	
						Meters.	Miles.
Westerloe Island (S. S. Mon. 170)....	42 37 18.58	73 45 41.43	307 25 56 280 37.52	Teller..... Moles.....	137 27 01 50 38 18	2730.6 1121.6	1.697 0.697
Denison (S. S. Mon. 166).....	42 36 48.66	73 45 22.28	298 02 39 154 42 22	Teller..... Westerloe Island.....	113 03 30 334 42 09	1892.2 1021.0	1.170 0.634
Papeconee Island (S. S. Mon. 158)...	42 35 53.31	73 45 30.05	243 02 26 186 56 04	Teller..... Denison.....	63 03 22 5 56 09	2141.7 1716.8	1.331 1.067
Patterson (S. S. Mon. 157).....	42 36 11.51	73 45 50.35	155 39 20 260 12 08	Corring..... Teller.....	335 39 03 80 13 19	1398.0 2406.7	0.869 1.495
Cooper (S. S. Mon. 164).....	42 35 09.31	73 45 14.35	142 19 13 23 36 30	Parke..... Van Wie.....	322 18 33 202 36 24	1909.8 581.1	1.186 0.330
Muller (S. S. Mon. 169).....	42 34 14.73	73 45 00.53	205 07 32 330 41 13	Grandview..... Van Denburgh (bolt).....	25 08 15 150 41 52	3386.6 2843.5	2.104 1.456
Winnie's dock (S. S. Mon. 160).....	42 33 52.36	73 45 17.54	311 24 39 209 15 41	Van Denburgh (bolt)..... Muller.....	131 25 24 29 15 53	2045.6 791.3	1.271 0.492
Winnie's Point (U. S. C. S.).....	42 33 16.64	73 45 26.11	24 10 30	Paarda Hook.....	204 10 30	2527	0.002
Paarda Hook (copper bolt).....	42 33 16.57	73 45 26.15	278 10 56 193 00 18	Van Denburgh (bolt)..... Muller.....	98 11 47 18 00 35	1748.5 1836.9	1.086 1.172
Campbell's Island (S. S. Mon. 163)...	42 33 16.34	73 45 05.86	260 48 18 133 49 34	Van Denburgh (bolt)..... Muller.....	100 48 55 3 49 37	1280.7 1305.5	0.802 1.122

[ASSEMBLY,



# NEW YORK STATE SURVEY.—GEOGRAPHICAL POSITIONS—HUDSON RIVER—ALBANY TO NEW BALTIMORE.

NAME OF STATION.	Latitude. ° ' "	Longitude. ° ' "	Azimuth. ° ' "	To station.	Back Azimuth. ° ' "	DISTANCE.	
						Meters.	Miles.
Cupola of Olcott's house .....	42 37 51.48	73 43 13.09	354 14 45 310 33 06	Rysedorph (U. S. C. S.)... Hallenbeck (U. S. C. S.)..	174 14 47 130 35 11	507.3 5543.4	0.315 3.444
Academy of Sacred Heart .....	42 37 38.63	73 46 21.68	271 24 49 354 26 31	Rysedorph (U. S. C. S.)... Corning.....	91 26 58 174 26 35	4335.4 1421.0	2.694 0.883
Greenbush Presbyterian church.....	42 38 09.16	73 44 57.37	37 07 40 340 07 41	Corning..... Teller .....	217 06 47 160 08 16	2955.1 3424.6	1.836 2.129
Cross-over light.....	42 36 47.83	73 45 46.02	247 28 53 102 47 08	Rysedorph (U. S. C. S.)... Corning.....	67 30 37 282 46 48	3312.2 692.1	2.369 0.430
South chimney of Patterson's house..	42 36 07.52	73 46 27.47	238 48 16 276 58 52	Rysedorph (U. S. C. S.)... Grandview.....	58 50 28 96 55 13	5230.9 3443.5	3.245 2.140
Van Wie's stone light.....	42 35 04.13	73 45 30.19	334 37 19 246 08 34	Van Wie..... Cooper .....	154 37 24 66 08 45	366.0 394.7	0.227 0.245
Paarda Hook light.....	42 33 16.01	73 45 25.89	160 53	Paarda Hook.....	340 53	18.17	0.011
Cow Island light.....	42 32 14.59	73 45 21.36	109 51 53 36 17 43	Vanderzee (bolt)..... Vrooman .....	289 51 15 216 16 40	1533.3 3570.4	0.956 2.218
Castleton Dutch Reformed church ...	42 31 56.40	73 45 21.98	127 06 42 42 10 57	Vanderzee (bolt)..... Vrooman.....	307 06 00 222 09 55	1796.4 3126.2	1.116 1.943
Nine-mile tree light .....	42 31 03.61	73 45 54.22	63 13 25 163 42 11	Vrooman..... Schermerhorn Island .....	243 12 44 343 42 07	1527.2 481.3	0.949 0.299

[ASSEMBLY,

	°	'	"	°	'	"		°	'	"		
School house cupola (near Mull's)....	42	30	23.92	73	47	16.62	Traver (U. S. C. S.).....	98	38	14	2228.1	1.885
							Ten Eyck (U. S. C. S.).....	146	47	38	3598.1	2.282
Schodack channel light.....	43	29	50.32	73	46	42.24	Traver (U. S. C. S.).....	63	39	06	1582.7	0.988
							Ten Eyck (U. S. C. S.).....	149	00	13	2397.4	1.428
Roha Hook light.....	42	28	48.75	73	47	20.12	Traver (U. S. C. S.).....	41	16	26	3462.0	2.152
							Ten Eyck (U. S. C. S.).....	91	57	03	2049.8	1.273
D. R. ch. tower, Schodack Landing..	42	28	47.76	73	46	13.58	Traver (U. S. C. S.).....	16	11	06	2741.4	1.704
							Ten Eyck (U. S. C. S.).....	94	13	41	530.4	0.330
Coeyman's dyke light.....	42	28	29.31	73	47	04.75	Orchard.....	203	05	44	1786.3	1.110
							Ball.....	136	29	55	1979.7	1.230
Flag pole on Knickerbocker ice house, Schodack Landing	42	28	23.16	73	46	26.53	Orchard.....	227	16	15	2142.3	1.831
							Roha Hook.....	314	00	16	1884.7	1.140
Flag pole on Coeyman's dock.....	42	28	22.66	73	47	24.26	Roha Hook.....	359	56	27	1290.0	0.802
							Mull's Island.....	81	15	09	440.3	0.273
Cupola of Academy in Coeymans ....	42	28	21.76	73	47	55.82	Yellow Pine (U. S. C. S.)..	78	52	42	10414.8	6.471
							Traver (U. S. C. S.).....	42	04	08	4626.0	2.873
Flag pole, Barren Island.....	42	28	03.82	73	47	12.43	Orchard.....	211	31	14	1005.0	0.624
							Van Dalsen.....	254	56	11	471.4	0.293
Briggs' monument, Coeymans cem'y.	42	28	00.15	73	47	42.98	Ball.....	103	29	49	2299.5	1.429
							Whannel.....	128	04	22	2964.0	1.841
Barren Island pine (county corner) ..	42	27	51.49	73	47	09.40	Barren Island.....	186	44	05	41.85	0.026
Five Hook Island light.....	42	27	47.12	73	46	55.83	Ball.....	96	36	49	1166.8	0.725
							Parsons.....	214	20	40	1463.8	0.909
Cupola of Knickerbocker's house.....	42	27	38.92	73	46	12.56	Ball.....	55	11	05	208.0	0.129
							Whannel.....	167	07	15	1202.6	0.747

# NEW YORK STATE SURVEY.—GEOGRAPHICAL POSITIONS—HUDSON RIVER—ALBANY TO NEW BALTIMORE.

NAME OF STATION.	Latitude.	Longitude.	Azimuth.	To station.	Back Azimuth.	DISTANCE.	
						Meters.	Miles.
New Baltimore dyke light .....	42 27 08.97	73 46 56.38	281 04 01 20 05 11	Whannel .....	101 04 38 200 04 57	1293.3 1386.9	0.803 0.861
M. E. church spire, New Baltimore..	42 26 52.30	73 47 18.27	353 13 40 262 53 50	Vanderpoel .....	178 13 40 82 54 04	787.6 501.4	0.489 0.312
Bapt. church spire, New Baltimore..	42 26 44.84	73 47 25.13	341 59 50 245 57 05	Vanderpoel.....	161 59 55 65 57 24	586.0 716.4	0.364 0.445
D. R. church spire, New Baltimore..	42 26 43.06	73 47 21.37	349 16 28 238 35 53	Vanderpoel.....	169 16 30 58 36 09	511.2 665.8	0.318 0.414
Flag pole on summer house of River- side House, New Baltimore	42 26 42.44	73 47 13.81	220 08 44 251 07 14	Bell.....	40 09 31 71 08 03	2434.9 1762.3	1.514 1.094
Chimney of shipyard, New Baltimore	42 26 37.79	73 47 13.46	14 08 40 246 43 29	Vanderpoel .....	194 08 38 66 44 18	350.2 1806.5	0.217 1.122
M. E. church spire, East Greenbush	42 35 14.61	73 41 57.90	153 51 54 114 05 25	Rysedorph (U. S. C. S.)...	338 51 04 294 04 04	4648.1 2986.2	2.888 1.855
D. R. church tower, East Greenbush	42 35 16.86	73 42 01.24	159 26 34 113 27 06	Rysedorph (U. S. C. S.)...	339 25 47 293 25 47	4556.3 2888.6	2.831 1.795
D. R. church spire, one mile north of Becker's Corners	42 33 41.71	73 48 20.41	280 09 28 380 23 36	Van Denburgh (bolt) .....	100 12 17 150 24 25	5796.6 7403.1	3.602 4.600



# NEW YORK STATE SURVEY.—LOT AND TOWN CORNERS.

DESCRIPTION OF LOT CORNER.	GEOGRAPHICAL POSITIONS.			COURSES AND DISTANCES FROM STATE SURVEY MONUMENTS TO LOT CORNERS.				
	Township.	Latitude.	Longitude.	From station.	True bearing.	Magnetic bearing.	Distances.	
							Feet.	Chains.
CAYUGA COUNTY.								
N. E. corner of lot 87 .....	Brutus .....	43 01 42	76 33 14	Tanner .....	N. 32 25 E.	N. 86 14 E.	3181	48.20
MADISON COUNTY.								
S. W. corner of lot 62.....	Lenox.....	43 05 14	75 48 01	Allis .....	S. 63 14 E.	S. 55 35 E.	1001	15.17
S. E. corner of lot 6.....	" .....	43 03 41	75 40 02	Bulger .....	S. 10 55 E.	S. 8 39 E.	1602	24.28
N. W. corner of lot 29.....	" .....	43 01 22	75 46 26	Cranson.....	N. 33 20 W.	N. 36 14 W.	2147	32.53
ONEIDA COUNTY.								
S. E. corner of lot 2 of allotment 4.....	Rome .....	43 13 49	75 27 33	Rome. ....	S. 31 29 E.	S. 23 37 E.	1685	25.53
N. E. corner of town.....	Stockbridge .....	43 02 16	75 33 18	Eaton .....	N. 10 40 E.	N. 18 36 E.	3224	43.85
S. E. corner of lot 57.....	Vienna.....	43 14 33	75 40 56	Vienna.....	S. 5 16 W	S. 13 40 W.	1753	26.54
ONONDAGA COUNTY.								
N. W. corner of lot 44; also angle of town line,.....	Camillus .....	43 05 53	76 16 50	Davison.....	S. 46 20 E.	S. 39 46 E.	2127	32.53
S. W. corner of lot 13 .....	De Witt .....	43 06 04	76 03 44	Collamer.....	S. 75 45 W.	S. 83 05 W.	645	9.77
S. E. corner of town .....	" .....	42 59 07	76 01 32	Green .....	S. 54 59 E.	S. 49 00 E.	2152	33.60
S. W. corner of lot 81 .....	Lysander .....	43 09 47	76 19 20	Munn Day .....	S. 87 13 W.	.....	2079	33.03
N. E. corner of lot 79.....	Manlius .....	43 01 46	75 54 57	Eagle .....	N. 43 06 E.	N. 50 32 E.	2478	37.54
S. W. corner of lot 38 .....	" .....	43 03 53	75 56 33	Kirkville .....	S. 18 41 W.	S. 25 44 W.	2315	42.65

N. E. corner of lot 118.....	Onondaga .....	43 00 17	76 11 84	Cossitt .....	N. 21 24 E.	N. 28 10 E.	1599	24.23
N. W. corner of lot 17.....	Pompey .....	42 58 00	76 02 82	Clapp .....	S. 23 18 W.	S. 29 30 W.	1286	19 03
S. W. corner of lot 110.....	Salina .....	43 05 46	76 11 24	Chestnut Ridge .....	S. 31 45 W.	.....	312	4.73
S. W. corner of lot 45 .....	Skaneateles .....	42 55 22	76 23 52	Hoxsie .....	S 27 10 W.	N. 34 00 E.	2747	41.03
N. E. corner of lot 22 .....	" .....	42 58 53	76 23 11	Seeley .....	N. 15 53 E.	N. 21 43 E.	2020	30.61
S. E. corner of lot 43 .....	Van Buren.....	43 05 43	76 16 49	Davison.....	S. 23 07 E.	S. 23 33 E.	3033	43 96
<b>WAYNE COUNTY.</b>								
N. W. corner of lot 73.....	Galen .....	43 03 21	76 53 37	Clyde .....	N. 64 27 W.	N. 58 44 W.	2207	33.44
<b>YATES COUNTY.</b>								
S. W. corner of lot 24 .....	Milo.....	42 34 43	77 02 18	Milo .....	S. 27 49 W.	S. 35 00 W.	3889	56.93



## NEW YORK STATE SURVEY.

ELEVATIONS, OF THE TOPS OF THE NEW YORK STATE SURVEY MONUMENTS, ABOVE MEAN TIDE AT GOVERNOR'S ISLAND, NEW YORK, BY TRIGNOMETRICAL LEVELING.

STATION NAME.	Monument number.	Township.	Elevation of monuments above sea.
<b>ALBANY COUNTY.</b>			
Vanderzee .....	Bolt.	Bethlehem .....	158 feet.*
Van Wie .....	146	Bethlehem .....	28
<b>CAYUGA COUNTY.</b>			
Mitchell .....	115	Sennett .....	881
NILES .....	107	Niles .....	1623
Tanner .....	116	Brutus .....	755
VICTORY .....	U. S. L. S.	Victory .....	568
<b>MADISON COUNTY.</b>			
Allis .....	121	Lenox .....	503
Bulger .....	112	Lenox .....	833
Canastota .....	143	Lenox .....	588
Cranson .....	122	Lenox .....	1321
FENNER .....	180	Fenner .....	1862
<b>ONONDAGA COUNTY.</b>			
Carpenter .....	105	Onondaga .....	1105
Chestnut Ridge .....	111	Salina .....	498
Clapp .....	131	Pompey .....	1280
Collamer .....	144	De Witt .....	485
Cossitt .....	119	Onondaga .....	1020
Davison .....	128	Van Buren .....	631
Draper .....	100	Geddes .....	653
Eagle .....	123	Manlius .....	1253
FABIUS .....	125	Fabius .....	2020
Fairmount .....	103	Camillus .....	736
Giles .....	114	Skaneateles .....	1265
Green .....	124	De Witt .....	974
HOWLETT HILL .....	109	Marcellus .....	1136

\* Top of bolt.

ELEVATION—*Continued.*

STATION NAME.	Monument number.	Township.	Elevation of monuments above sea.
Hoxsie .....	134	Skaneateles .....	1198
Kingsley .....	126	Van Buren .....	537
Kirkville .....	120	Manlius .....	507
Munn Davis.....	140	Lysander.....	535
Olympus .....	101	Syracuse .....	681
RIPLEY HILL .....	106	Spafford .....	1968
Seeley.....	137	Skaneateles.....	1109
Sherwood.....	104	Camillus.....	799
Sorrel Hill.....	110	Van Buren.....	641
ONEIDA COUNTY.			
Eaton .....	129	Stockbridge .....	1318
Prospect. ....	117	Kirkland .....	1384
Rome .....	142	Rome .....	510
STARRE HILL .....	127	Steuben .....	1800
TASSEL .....	29	Marshall .....	1946
Vienna .....	138	Vienna .....	568
OSWEGO COUNTY.			
AMBOY .....	141	Amboy .....	793
GILBERTSVILLE .....	108	Schroepfel .....	521
RENSSELAER COUNTY.			
Grandview .....	149	East Greenbush.....	420
Hallenbeck .....	151	East Greenbush.....	638
Rysedorph.....	2	East Greenbush.....	411
Teller .....	148	East Greenbush.....	407
Traver .....	152	Schodack .....	236
Van Denburgh.....	Bolt.	Schodack .....	264*
YELLOW PINE .....	U. S. C. S.	Schodack .....	460**
WAYNE COUNTY			
CLYDE.....	U. S. L. S.	Galen .....	633
YATES COUNTY.			
MILQ .....	118	Milo .....	1343

\*Top of bolt.

\*\* Top of underground mark,

## TABLE

*Showing approximate declination of magnetic needle.*

STATION.	County.	Township.	Variation of the needle.	Date.
			West.	
Helderberg .....	Albany .....	New Scotland .....	8 45	September, 1877.
Cass .....	" .....	" .....	8 45	December, 1877.
Clarksville .....	" .....	" .....	8 45	" "
Freleigh .....	" .....	Watervliet .....	9 30	" "
Knowersville .....	" .....	Guilderland .....	8 45	" "
Niskayuna .....	" .....	Watervliet .....	9 45	" "
Slingerland .....	" .....	New Bethlehem .....	8 45	" "
Winn .....	" .....	Guilderland .....	9 00	November, 1877.
Tanner .....	Cayuga .....	Sennett .....	3 49	June, 1878.
Allis .....	Madison .....	Lenox .....	7 39	July, 1879.
Bulger .....	" .....	" .....	7 16	" "
Canastota .....	" .....	" .....	7 24	" "
Cranston .....	" .....	" .....	7 16	" "
Eaton .....	" .....	Stockbridge .....	7 56	" "
Rome .....	Oneida .....	Rome .....	7 52	" "
Vienna .....	" .....	Vienna .....	8 24	" "
Clapp .....	Onondaga .....	Pompey .....	7 12	August, 1878.
Collamer .....	" .....	De Witt .....	7 20	July, 1879.
Cossitt .....	" .....	Onondaga .....	6 46	August, 1878.
Davison .....	" .....	Van Buren .....	6 34	" "
Eagle .....	" .....	Manlius .....	7 17	" "
Green .....	" .....	De Witt .....	6 59	" "
Hoxsle .....	" .....	Marcellus .....	6 50	" "
Kirkville .....	" .....	Manlius .....	7 03	July, 1879.
Seeley .....	" .....	Marcellus .....	5 50	August, 1878.
Conover .....	Schenectady .....	Esperance .....	9 30	November, 1877.
Chapman .....	" .....	Duanesburg .....	8 30	" "
Sears .....	" .....	" .....	9 15	" "
Van Atten .....	" .....	Glenville .....	10 15	" "
Mann .....	Schoharie .....	Schoharie .....	9 00	" "
Summitt .....	" .....	Summitt .....	8 45	" "
Holmes .....	" .....	Richmondville .....	9 00	" "
Clyde .....	Wayne .....	Galen .....	5 43	June, 1878.
Milo .....	Yates .....	Milo .....	7 15	" "





# REPORT.

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OFFICE OF THE STATE ENGINEER AND SURVEYOR, }  
ALBANY, *March 10th*, 1880. }

*To the Honorable the Legislature of the State of New York:*

During the past season the canals of New York have shown in a striking way their value to this State, and to the commerce of the country. Although the season of navigation was not as long as that of last year, the tonnage carried is greater by nearly 200,000 tons. It is also a matter of congratulation that the boatmen who use them have had fair returns for their labor and investments, and have thus gained strength in their efforts to enlarge their business.

As we depend upon them to give revenues to our public works, this fact is of importance to our citizens, for they are practically the partners of the State, and its ability to keep up its commercial position depends upon the prosperity of those who use our water routes. But their success is not measured by the amount of commerce which they bring to our State. They must also be credited for the great savings they make to all industries by keeping railroad charges within reasonable limits. The whole cost of maintaining our canals is but a trifle compared with the taxation which is thus lifted off from all business pursuits.

What has been earned by those navigating the canals will be mainly invested in new boats. A large number of these have been built this winter. This has not only given employment to many mechanics, but it has rescued our public works from great danger, as there was reason to fear that boatmen might lose confidence and withdraw from competition with railroads. Without their boats canals are useless. They have now gained means, credit and courage.

The past year has been one of great commercial activity. The balance of our exports over imports has been very large, and has given prosperity to all branches of trade and industry. In view of the amount of property carried, and the demands made upon all

the routes of transportation, the freights have been reasonable, although they were higher than their scale in ordinary years. The property carried to the seaboard through our canals amounts to 3,973,269 tons. But this shows only a part of the service they have done. They have kept down freights and increased our exports, as no combination or pooling arrangements can be made by roads with the owners of thousands of boats. Their charges have forced the railroads in a large degree to come down to the rates of the water routes. In this way the Erie canal has been of great value to producers in all parts of the Union, who send grain or provisions to the eastern or European markets.

To the people of this State the canals have been of special value in keeping up the volume of commerce through its limits. While the importance of railroads cannot be overstated, it is conceded that they do not give to New York the same advantages which it gets from water routes. So far as these roads take the place of canals they turn away a large share of the commerce which we once exclusively enjoyed. No arguments urged by the friends of canals have ever put their value in a stronger light than the reason urged by railroad officials in defense of their practice in making combinations which give to other States more than half of a commerce that once was held solely by New York. They not only admit, but they urge in their defense, that railroads cannot keep for this State what it once had when water routes gave it commercial supremacy. This truth is presented in a way so clear and able in the defense made of the compacts by which our roads give a share of trade to rival routes, that I quote the language of one of the advocates in defense of them, upon the ground of necessity. He said in his speech before the legislative investigating committee, in defense of pooling arrangements :

That "*New York is now practically confronted with this state of things. Railroads from the west to Boston, Philadelphia and Baltimore, have been built and will be used. It is not possible for New York to have that essential monopoly of trade with the interior of the country which she had 'when water ways were the main routes.'*" \* \* \* \* \*

"*Let us look at the matter in the light of undeniable facts. I have already shown that when the canals and the Hudson river were the only outlet for western cereals, New York had virtually a monopoly, the route to her being hedged in by natural barriers which her rivals had no power to break down or overleap.* THE OPENING

OF GREAT THROUGH LINES OF RAILROADS BROKE DOWN THESE BARRIERS AND AT ONCE CHANGED THE SITUATION." But the fact remains that New York still owns the water route, with which no other can compete, and the question forces itself upon our attention, shall we fail to uphold or to neglect those advantages which nature gave exclusively to us? Shall we abandon these and place our reliance solely upon railroads, when those who own and control them thus declare in *strong* terms that they must divide with others what was once the sole privilege of our State, and which lifted it up to its position at the head of all the members of our Union?

How far these facts justify the combinations that have been formed it is not my province to decide, that subject is in the hands of the legislature.

The undersigned has no hostility to railroads, and feels their value and necessity; but still the truth stands boldly out as stated in behalf of the railroads, "that our State does not enjoy the essential monopoly of trade with the interior of the country, which she had when the water routes were the main routes." We still have the exclusive control of the water routes, and it is now admitted that we must look to them to save our commercial supremacy. Shall we not then foster and uphold the advantages which nature gives us? Shall indifference to the business men and boatmen who use these water routes discourage them in their efforts to keep the enriching channels of commerce within our territories? Shall a spirit of hostility be excited against them in the minds of our people by untrue and unfair statements of our debt, which lead the public to think that the canals now in use have made a part of what is called the "canal debt," while in truth they have paid into the treasury large sums beyond their cost, although our so-called canal debt was made by the cost of ~~works~~ in parts of the State remote from the canals?

Will New York consent to let the dangerous provision in the constitution stand, that no more may be spent to keep them in use than the receipts of the previous year? A single disaster, an unfavorable season may cut down the tolls so that they may not be equal to the cost of opening, the next year. In this event no matter how small the deficiency may be, the legislature is not allowed to give one dollar to save them from destruction. They must be abandoned and an incalculable loss of property and prosperity inflicted upon our State.

This hostile provision of the constitution was due to the feeling produced by canal frauds on the part of officials and of legislators



elected by the people. These frauds are in no degree chargeable against our public works, or against that large body of hard-working citizens who beyond any others labor for the exclusive benefit of this State, and who struggle to keep for it what it once had, the control of the main routes of transportation.

Inasmuch as this debt is due to the fact that our State gave to the lines of railroad along the Erie canal the right to carry freight, which they did not have by their charters, nor at the time when the debt was created, it would be more just and more truth-telling to call it a *railroad* rather than a *canal* debt.

The statements in the report of the comptroller for this year show how rapidly the receipts of grain are diverted from the harbor of New York to rival ports.

The following paragraph should alarm our citizens, and at the same time should teach them how great are the disasters which overhang them, if they do not keep up and improve the channels of the canals now in use:

"Baltimore, Philadelphia and Boston received by rail, for eleven months of 1879, 49,010,201 bushels of corn, against 39,721,917 bushels received at New York by rail and water. Of New York's receipts 19,700,749 bushels were by water. The receipts of the three cities by rail were, therefore, 28,988,973 bushels more than were received at New York by rail."

A few years since our water routes carried to our commercial metropolis all the products of the west. In the future as in the past the cost of transportation will always decide our ability to export our products. But for the cost of transportation we could so far undersell the producers of other countries that we could always find markets for our products. The cost of carrying turns the question not only of our foreign but our homecommerce, and that more than all other questions determines the prosperity of our country. Every combination or pooling arrangement which puts up the price of freight checks in some degree our ability to sell abroad, and is always at the expense of the public interest and the prosperity of our people. The great problem is, how to get the cheapest ways to markets, and how to check combinations between great companies, which either cut down the prices gained by our producers or prevent the sale of their products. This cheap transportation which is vital to our country can only be secured by competition, otherwise the direct, concentrated and persistent influence of railroads overcomes the diffused and irregular efforts of the public.

Experience has shown that water routes are the only ones that cannot be drawn into combinations. They are free to all, and are used by so many parties that they cannot combine against the public. The stability, growth and value of our commerce depends upon their maintenance.

The safe, economical and honest management of railroads will best be secured by competing water routes.

This truth is shown by efforts made to improve them. The Mississippi is being made navigable for large vessels from the head of navigation to the gulf, by appropriations from the government. The work of enlarging the Welland and St. Lawrence canals goes steadily on. Conventions have been held at St. Paul and other places to urge upon Congress a speedy deepening of the channels between the great lakes.

The tonnage of the canals during the past year was 5,362,372, as compared with 5,171,320 in 1878. It must be borne in mind that the season of navigation was nearly a month shorter, and the great volume of business was in the last part of the season. In some degree the amount of tolls was lessened by their reduction on west bound freight. This brought back to the canal some trade, and there is no doubt that the revenues will be helped by lessening the charges on articles carried from the east to the west. Even this year much was gained in this way as it helped the boatmen at a time when there was little produce coming from the west. All of them would not have been able to keep their boats in use, had it not been for this reduction in tolls. It is of vital importance that they should be able to keep in good condition their boats and equipments, without which the canals are useless.

Just complaints are made of many charges upon commerce in the city of New York, and of the fact that terminal facilities are not given to vessels or railways which bring produce or other articles to its harbor. Gross injustice is done to our canal boatmen and through them to the State, for its revenues are cut down by every tax and inconvenience imposed upon them at New York. The number of boats varies in the course of years from four to six thousand. If they suffer any interruption on their way to New York the boats collect in great fleets at various points, and when these fleets reach the city they need ample and convenient docks for their safety, and for a prompt discharge of their cargoes.

The commerce of New York has been very much helped by a growing practice of using the last boats which go down in the fall

for the storage of the cargoes until they are wanted for shipment to other places. This saves cost and at the same time helps to bear the winter expenses of the boatmen.

Great injury and wrong was done to them last fall, from the fact that there was no sufficient dockage for their boats. They were forced away to inconvenient places, and by a route exposed to some dangers before they could dispose of their cargoes. This difficulty will grow with the growth of canal commerce and the increase in the number of boats. Different plans have been suggested to remedy *this evil*. To determine the relative merits of these plans there must be a careful investigation. A canal boat loaded with grain is worth about twelve thousand dollars, and requires a safe and convenient harbor. When it reaches New York the rules require that the captain report the arrival of his boat, and that its cargo be inspected by the proper official; until this is done the boat has to pay all the expenses, and is still considered as on her way to market. Before the cargo of a boat is sold, sometimes three or four samples have to be taken out of her. It is necessary, therefore, that the loaded boats have some place assigned them where they are near the center of business and where there is no danger. There is no place that meets these requirements so well as the present canal district. It is shut off from the strong winds that make the docks on the Hudson river dangerous, and it is close to the produce exchange and that quarter of the city where the class of commodities which are carried on canal boats are sold. The piers and slips, from 2 to 10 on the East river, were set apart by statute for the use of the canal commerce, and the interest of New York demands that they should be protected in the enjoyment of them. There is no trouble about quarters for light boats; they find suitable refuge in the various basins around the city, at a distance from the center of business. The boatman is the partner of the State, and it is no more than just that he should have assigned to him such docks and piers belonging to the State as will enable him profitably to conduct his business. Section 3, chapter 487 of the Laws of 1862, is as follows:

“The captain of the port shall set apart, keep and reserve all that part of the water adjacent to the wharves of the city of New York, from the east side of pier number two to and including the east side of pier number nine, East river, from the twentieth day of March to the first day of January in each year, for the exclusive

use and accommodation of canal boats and barges engaged in the business of transporting property on the Hudson river, or coming to tide-water from the canals of the State, or arriving in said port from Albany or any port west or north thereof, and he shall assign such other accommodation for said canal boats and barges in other parts of the port of New York as may, from time to time, be necessary in receiving or discharging their cargoes."

SEC. 4. "No vessels other than canal boats, barges or lighters receiving or delivering property from or to said canal boats or barges, shall use or enter into for the purpose of using any part of the port of New York set apart for the use of canal boats or barges, without the written consent of the captain of the port first had and obtained therefor, and then only between the first day of January and twentieth day of March in each year, and when not occupied by canal boats, under a penalty of one hundred dollars for every day that such vessel shall remain in said part of said port so set apart, after being notified to leave by the captain of the port or a harbor master, and said penalty shall be a lien upon any such vessel, and be enforced by proceedings against, instituted by and in the name of the captain of said port according to the provisions of the laws of this state, concerning attachments against vessels."

Something must be done promptly to give proper convenience to the canal boats. The State owns the canals and has superior rights and direct interests in this respect that must not be imposed or trampled upon by rival interests or competing routes. The trouble encountered by the boatmen in the harbor of New York, and along the lines of our public works, brings into view the necessity of such an organization, as will enable them to bring their grievances before the legislature and the public, in a way that will command attention.

As matters now stand there is no way by which the facts (which boatmen know better than any other class) can be collected and set forth. This is hurtful not only to them but to the people at large. If they are put upon the footing of the State Agricultural Society, and furnished at Buffalo or New York with a suitable room to which they can resort, and where they can report all evils and abuses, it will be a great protection against mismanagement and will save the canal revenues from many wasteful charges.

The annual reports of such an association, published and placed among the official documents of our State, would in a few years

give an amount of facts and general information of great value. The State as the owner of the canals owes it to itself to secure this, when it can be gained at a cost so trifling.

The prosperity of New York requires that our water route, which consists of the great lakes, the Erie canal and the Hudson river, shall be able to compete, not only with the railroads but with the water routes that are made, or are being made, in other parts of the country. To enable them to do this they must have a greater depth of water. The general government is alive to this necessity for lake and river commerce.

A letter printed in this report from General Wetzel shows that soon sixteen feet of water will be carried through the lock at the Sault St. Marie and through the St. Mary's river.

The St. Clair ship canal has sixteen feet in depth, and about one-third of the work of deepening the channel of the "Lime Kiln crossing" to a depth of twenty feet has been accomplished. It is the plan of the government to secure a depth of sixteen feet of water to the channel between Lake Superior and Lake Erie, thus giving an advantage of two feet and a half to vessels going to Buffalo over those going through the Welland canal.

The depth of water over the mitre sills in the locks on the Welland canal is only fourteen feet. The largest vessels which can pass these locks can carry but 2,000 tons and it is not safe to allow them to draw more than thirteen and one-half feet of water. The same vessels can carry an increase of 625 tons to Buffalo when the plan of the United States government is accomplished. Large sums of money have been appropriated by Congress and by this State for the improvement of the Hudson river, and ten feet of water has been secured.

This brings us to the consideration of the remaining link in this chain of navigation, viz.: The Erie canal which has only a depth of seven feet, and the largest boats which pass through its locks can carry but 250 tons.

At one time this season boats carried a bushel of wheat for less than four cents from Buffalo to New York. It does not seem possible that this was a living price after deducting tolls and elevator and New York charges, although the canals were in good condition, were well managed, and every facility was given to the boatmen. Their boats draw as much water as it is safe to allow them; they are as long and as wide as can be and pass the locks; they have sufficient depth of water in the Hudson river, and the charge for tow-

ing from Albany to New York is not unreasonable. Yet in face of these low charges and this unimpeded navigation, our commerce is threatened by a northern rival.

Within a few years the Welland and St. Lawrence canals will be opened from the Atlantic to the great lakes to vessels carrying eight times the cargo of the largest boats on the Erie canal. This route from Chicago to Montreal is 1,250 miles in length, which is 147 miles less than the distance from Chicago to New York. Of these 1,250 miles but 71 are canal, the remainder is lake and river navigation.

In the route through this State there are 368 1-2 miles of taxed canal navigation. The economy of transportation on an unlimited water-way, like a lake or a river, is seen by comparing the cost from Chicago to Buffalo with that from Buffalo to New York.

The lowest price at which wheat has been carried upon the lakes was one and three-quarter cents a bushel, while that upon the Erie canal was three and three-quarter cents, or twice the price for only about half the distance. The conclusion is inevitable that unless some change is made in the Erie canal the largest share of business (which always seeks the cheapest channels) will leave it and go to Montreal instead of New York. It is not merely a question how we can cheapen transportation, but how we can save our commerce. We can save it if we will. There is great economy in carrying large cargoes, and the greater the number of trips during a season the greater the profit. Our boats must carry larger cargoes and move at greater speed.

The constitution forbids a greater expenditure in any one year than the gross receipts of the previous year. Out of this sum must come the cost of operating the canals, and doing such new work as is necessary for its maintenance. This prevents the lengthening of the locks or making great changes in the character of the prism. But much can be done with the means under our control.

In my last annual report I showed by experiments made under my direction that if the boats in use could draw a foot more of water they would make a saving of one cent on every bushel of wheat carried, which is nearly equivalent to doing away with tolls. I also showed that a great saving in time would be made if power was placed upon the locks to draw boats in and out of them, and to operate the valves and gates.

The estimate for doing the work of giving another foot of water on the eastern division of the canal was less than two hundred and

forty thousand dollars. This increase of depth upon a portion of the canal, although it would not allow boats to carry any more cargo from Buffalo to New York until the same depth is gained throughout, would make a great saving in the cost of transportation. This was illustrated in the trip of the steamer Emma and consort last season. The canal from Buffalo to Rochester will average eight feet in depth, and over this portion of the route, one-third better time was made with one-half the cost than over a like distance with seven feet depth of water.

During the past season the banks in several places were raised by the section superintendents, by taking the best material from the bottom of the canal and placing it upon the banks, and raising the paving in front to protect the slope. The price at which this was done shows that the estimate (a copy of which will be found in the appendix) for giving another foot of water to the canal, as stated in my last annual report, was ample, and that eight feet of water can be secured from Buffalo to Albany.

The additional water supply needed for this increase of depth will be small, there being a surplus upon the eastern and western division. More water on the middle division is needed for the present depth of canal, and when provisions are made for this, a very little extra cost would secure sufficient for the additional depth.

In this connection I would call your attention to the opinion of John B. Jervis and Van R. Richmond, in Mr. Alonzo Richmond's letter on "The causes that determine the cost of transportation on the canals," which letter is printed herewith.

Those interested in the canals of New Jersey have seen the importance of quick lockages and have steam power to open the valves and gates and to draw boats in and out of the locks.

Large vessels on the New Jersey canals, carrying nearly twice as much, can lock through in less time than our boats.

If the plan of using the feed waters to do what in New Jersey is done by steam was applied to the five up lift locks going east on the Erie canal between Port Byron and Syracuse, a saving of time and expense both to the boatmen and the State would be the result. It is within the power of the legislature and the canal authorities within the next five years to lessen the cost of transportation to an amount equal to the present tolls on every bushel of wheat. Every mile thus improved will be felt on every boat. The reduction of one cent in the cost of transportation with the improvement of the lakes and Hudson river would give to our water route such

an advantage in point of economy that there would be very little danger of our commerce being diverted by the Welland canal or by any other channel.

The saving on the lakes and canal of time and cost would secure to us the commerce of the west against rival railroads or water routes.

#### WATER SUPPLY.

For nearly a month, during the past season, the water on the Rome level was with difficulty kept at the depth of seven feet. It was only by the diligent efforts of those in charge that navigation was maintained. By lowering the outlet of lakes and reservoirs, every drop that was available was drawn out. It was found impossible to get a supply of water at all times on the Black River canal, north of Boonville, and on the Oneida Lake canal. No greater calamity could have happened than the closing of the Erie canal at a time when the bulk of the grain was coming forward, and when the boatmen were receiving fair rates for carrying. If the rainfall during the season of navigation of 1880 should be as light as during the past season, canal navigation might be seriously obstructed. There are several plans by which this calamity can be prevented. They are set forth in the report of the division engineer of the middle division.

I call the attention of the legislature to this matter as one which should receive their early and earnest consideration.

HORATIO SEYMOUR, JR.,

*State Engineer and Surveyor.*



## APPENDIX.

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BUFFALO, *October 15, 1879.*

MY DEAR SIR — I will give you the causes that I think determine the price of transportation on the Erie canal, viz.: Tolls, condition of the canal, size of the boat, the number of boats in use, and the supply and the demand.

To make this more clear, I will take up these points separately.

*First* — Tolls. We will suppose the canal to be free from tolls, then a boat of two hundred and forty tons, or that carries eight thousand bushels of wheat, when it gets for the down trip from Buffalo to New York, four cents a bushel, saying nothing of the return load, on the season's business of seven round trips it would receive \$2,240. If the tolls were six cents a bushel on wheat as they were up to the year 1870, the freight to produce the like profit, would have to be ten cents a bushel, or the boat would have to earn during the season \$5,600. If the tolls should remain one cent a bushel as they are now, a rate to produce an equal profit must be five cents a bushel, or receive on the season's business \$2,800. The cost of moving property on the canal has always been lower in proportion to the reduction in tolls, unless there were other causes that influenced the price, viz.: scarcity of boats or urgency of shipments.

The second item is the condition of the canal. The better its condition, and the deeper the water is maintained in its channel, the cheaper work can be done on it. This is a very important point in the cost of transportation.

To appreciate the advantages which an increased depth of water gives, see State Engineer Seymour's Report for 1879, on pages 9 and 11, also see his report on the trip from Buffalo to New York, on the canal steamer and consort Emma and Hathaway, made this past summer. I would also refer you to the letter of Mr. Thomas Calden Ruggles, to Mr. Franklin Edson, president of the New York Produce Exchange, published with his address delivered before that body May 27, 1879, on the advantages of an increased depth of water the whole length of the Erie canal.

I believe if the Erie canal should be increased in depth one foot, or at most two feet more than it is now, steam boats could be run profitably and with more economy than horse boats can be. To let you see that it is entirely practical to add two feet more to the depth of the Erie canal, except in the locks, over the aqueducts and

culverts, I give you a copy of a letter I received from the Hon. Van R. Richmond, formerly State engineer.

LYONS, *September 2, 1878.*

DEAR SIR — In reply to yours of August 23d, I have to say that I think it practical to raise the surface of the water in the Erie canal one foot by raising the banks and to lower the bottom one foot, except over the culverts and aqueducts. The lower mitre sill of the locks must of course remain as they now are. I am confident that a full supply of water could be obtained.

Yours truly,

VAN R. RICHMOND.

To ALONZO RICHMOND, Buffalo, N. Y.

The Future of the Erie canal, by John B. Jervis C. E., from *International Review* for May and June, 1878, page 393.

"A further improvement is practical at a moderate expense, by raising the water in the canal one foot, which may be done by raising the lock gates or putting a plank on the top of the present gates, which would be a small expense, and raising the banks of the canal to correspond. All this may be done in the course of repairs at no great expense, as the lock walls are now sufficient for such rise and require no change. These means will enable the canal to improve the economy of transportation."

This would give eight feet of water in the lock, over the aqueducts and culverts, and in all other places full nine feet.

The third item is the size of the boat, the greater the tonnage of the craft, that it is practical to navigate on the canals the cheaper property can be transported on it.

In making shipments by canal time is not so much an object as cheapness of freight. For the tonnage of boats in use on the canals in years past, see Auditor Schuyler's report for 1876, on pages 57 and 58.

The largest size boat now in use on the canals is about two hundred and forty tons, or that will carry eight thousand bushels of wheat; the smallest is about one hundred and eighty tons, or that takes six thousand bushels. The average is about two hundred and ten tons; that loads seven thousand bushels. The difference in the capacity of a boat of one hundred and eighty tons, and one of two hundred and forty tons is sixty tons.

This is a saving in the cost of transportation to the larger boat over the smaller one of about a cent a bushel. The difference between a boat of two hundred and ten tons and one of two hundred and forty tons, which is now the largest boat that can now pass the locks, drawing six feet of water, is thirty tons; which makes fully one-half a cent a bushel in favor of the larger boat, as their cost is nearly the same, and the expense to run one is no more than the other.

If the Erie canal was deepened its whole length two feet more than its present depth, a boat to be towed by horses could be built, having from twelve to fifteen inches greater draft of water than boats are now allowed to draw, that could easily carry three hundred tons, or ten thousand bushels of wheat, sixty tons more than the largest boat now in use. A steamer and consort could be built, having a draft of seven feet of water, so that two boats would carry nearly six hundred tons, or nearly twenty thousand bushels of wheat. Such a pair of boats could be managed with ease, and no more costly to navigate than the size now in use, with the present condition of the canal. This would cheapen the cost of transportation about one cent a bushel on wheat. Thus it is apparent that these larger boats could transport a bushel of wheat from Buffalo to New York, free from tolls, giving them the return loads they would be sure to receive at less than three cents a bushel, at any rate, *at a price so low that it would be difficult for any other route to successfully compete with it.*

The fourth item is the number of boats on the canal. If a sufficient amount of tonnage is not kept up the price of freight will increase and remain so until more boats are built. For a statement of the number, tonnage and capacity of boats built in each year since 1837 to 1877, see State Engineer Van Buren's Report for 1877 on page 82. You will see that the number of boats built yearly is much less since 1873, and for years before, from the effects of high tolls, its bad condition under the contract system, and the strong competition of the trunk lines of railroads.

For the years 1874, 1875 and 1876, especially the year 1876, the profits to the boatmen were very small. Since the spring of 1877, when the tolls were reduced to the present rate, boatmen on the season's business have generally obtained paying rates; their earnings have for each year on the whole been fairly remunerative. The tonnage is beginning to increase.

If the trunk lines of railroads should stop their warfare on the water route, no longer carry property from the western States to the Atlantic ports, at the same or less price than they do for the citizens of the State of New York, or if there was maintained a more just tariff on rail rates than there has been for several years past on east bound shipments, and if the railroads should keep their rate from Chicago to New York, at say, thirty cents a hundred or eighteen cents a bushel for wheat, which is surely as low as they can afford to do it, the present tonnage on the canals would be found insufficient. For the water route from Chicago to New York, by the lakes and the Erie canal, can carry property at good profit at one-half that price.

The fifth item is supply and demand. Fortunately for the water route in this latitude the great bulk of property to be transported moves during the time of lake and canal navigation. It varies during the open season, the greater amount in the earlier and the latter parts; for this reason boatmen expect to get low freights in the middle of the season, when freights are scarce, and make their

profits by getting higher prices when the larger amount goes forward.

The lakes and the canals are always free and open to competition. They cannot be subject to any monopoly. When the tonnage is sufficient, and not influenced by any unnatural condition of things, such as the warfare of the trunk lines of railroads on the water route, as we have seen in years past, the rates of freight will be governed by the natural laws of supply and demand. If there is a large amount of property to be carried when harvests are abundant and business is prosperous, a high rate of freight will be obtained, but if the crops are poor and business is depressed, low rates will prevail. On the whole and through a series of years freights cannot be unreasonably high in price.

Yours truly,

ALONZO RICHMOND.

To Hon. HORATIO SEYMOUR, JR.,  
*State Engineer and Surveyor.*

UNITED STATES ENGINEERS' OFFICE,  
26 WASHINGTON AVENUE,  
DETROIT, MICH., November 28, 1879. }

Mr. HORATIO SEYMOUR, JR.,  
*State Engineer and Surveyor, Albany, N. Y.:*

DEAR SIR— Your letter of the 26th inst., directed to Gen. Comstock, has been referred to me, as I am in charge of the works of which you desire the information.

According to the stage of water that exists vessels can carry from eleven feet three inches to thirteen feet through the old locks of the St. Mary's Falls canal. When the new lock is completed sixteen feet can be carried through it. At present scant thirteen feet can be carried through the St. Mary's river. I have begun the work of making a sixteen-foot channel throughout its entire length. Sixteen feet can at all times be carried through the St. Clair Flats Ship canal and Lake St. Clair. Scant thirteen feet can be carried over the Lime Kiln crossing at present. I am engaged in excavating a twenty-foot channel through it. There is always plenty of water at the mouth of the Detroit river.

In general, it is proposed to improve the water-way from Lake Superior to Lake Erie, so as to have, at all times, a sixteen-foot channel.

The walls of the new lock at the St. Mary's Falls canal were completed during the year. It will probably be in operation early in the season of 1881. The canal itself has been widened and deepened, and the work on the improvement of the St. Mary's river has just been begun.

The St. Clair Flats Ship canal is completed, and about one-third of the work on the Lime Kiln crossing has been done.

Very respectfully,

G. WEITZEL,

*Major of Engineers, Brevet Maj.-Gen., U. S. A.*

## RED RIVER COUNTRY.

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The amount of grain which the west will produce in years to come is only to be estimated by the increase of past years and the amount of territory still undeveloped. Hon. L. P. Perkins of Buffalo, in his speech delivered before the Free Canal Association of Buffalo, says :

"This western and north-western region, from which we are to derive this commerce, is not more than one-tenth developed in any of its resources and productions. Indeed the State of New York with all her mineral wealth and resources is not one-half developed. What will be the resources of these vast States and Territories, at the end of the next decade, if the same ratio of increase continues, which has marked the past ten years? The answer to this question is obvious. The vast surplus products which will then seek tide water will glut not only the Erie canal in its present condition but all our railroads as well. This immense commerce will make it imperatively necessary for this State to not only make her canal free from all tolls, but also to enlarge the same from Buffalo to Albany. We must prepare for the future."

Years ago a project for connecting the waters which flow to the Gulf of Mexico, and St. Lawrence, and Hudson bay, was suggested by far-seeing men, but as it has turned out they were in advance of their times.

The Selkirk settlements were weak communities of half-bred hunters, northern Minnesota and eastern Dakota were uninhabited, grassy plains traversed by wild Indians in pursuit of the wilder buffalo.

All this is changed now, the half-breed settlements are now portions of a prosperous, progressive province of the Dominion of Canada, and upper Minnesota and Dakota have a large population, which is increasing daily with marvelous rapidity.

The valley of the Red river contains a great area of very superior wheat lands, ready for the plow, and has seasons warm enough, and long enough, to produce in perfection all the crops of the temperate zone; besides this, its climate is very salubrious.

This proposed navigation which contemplates the connection by means of locks, dams and short stretches of canal, of the St. Louis river (which empties into Lake Superior at Duluth), with the Mississippi and the Red river of the North, is best illustrated by publishing extracts from a report made by George R. Stuntz, Esq., of Duluth, a competent civil engineer, who has made a reconnaissance of it, which is added below :

"It will be observed with surprise to many, that the elevation at the meeting of these waters, which flow to the tropics, and to the arctic regions, is but some 1,200 to 1,300 feet above the sea level, and that an amount of lockage about equal to that of the Erie canal will be sufficient to connect them all."

The great benefits this scheme of internal improvement, if carried out, would confer on our lake navigation, extending its sources of freight supply, by cheap water carriage, away up to the eastern base of the Rocky mountains, through the navigable lakes and rivers of British America, is an excuse for giving it so much space in this report, Mr. Stuntz says:

"With the improvement of the Mississippi river to Cass lake it will afford cheap transportation for all parts of the State drained by the Mississippi river and its tributaries.

"The route I deem most practicable, most far-reaching in its results, contemplates the improvement of the Mississippi river from St. Paul to the mouth of the Turtle river on the north side of Cass lake; thence by canal through the Turtle lake to Red lake, in Beltrami county, thence west, by the improvement of Grand Forks, to Red river. The improvement of Grand Forks to Red lake by the construction of dams and locks will not be expensive. Distance, from Crookston, about 75 miles to Red lake; thence to east end of the lake, 20 miles; thence by canal across the summit of Cass lake, 38 miles; thence down the Mississippi river to the mouth of the West Swan river, 150 miles; thence by canal to the mouth of Floodwood river on the St. Louis river 18 miles (canal); thence down the St. Louis to Thomson (slackwater navigation, lockage 200 feet), 37 miles; thence to Fond du Lac, 9 miles; lockage about 400 feet. From the head of Knife falls to Fond du Lac about 16 miles of canal and very expensive work will be required (but material is convenient); thence to Duluth by river 15 miles, making the whole distance, by canal and slackwater navigation, 362 miles from Duluth to Crookston, where the St. Paul and Pacific railroad crosses the Grand Fork. Of this distance 63 miles only will be canal. From the mouth of Floodwood river to the mouth of West Swan river, on the Mississippi river, the route is most the way across a tamarac flat.

"The elevation of the summit between Cass lake and Red lake is about seventy-five feet above those lakes. Upper Turtle lakes will serve as reservoirs.

"There will be no rock excavation on this route except between Fond du Lac and Knife falls, and at Pokegama falls on the Mississippi. With these improvements made, the whole State of Minnesota, north-eastern Dakota and Manitoba will have cheap freight communication with Lake Superior. These communications will be available for six months in the year.

"Boats can load at Duluth and transport freight to the Rocky mountains, at the head of the Gaskatchewan river, without breaking bulk, bringing in return grain.

"It will open up 1,000,000,000 feet of pine timber on the St. Louis river and its tributaries to three distinct markets that now cannot be reached.

"It will tap the rich mineral regions along the Massaba mountains and secure the building up of a vast iron interest. It will utilize the vast water power of three large rivers for manufacturing purposes.

"Red river valley alone, within a circle of eighty miles from the mouth of Grand fork, is capable of producing for export annually 60,000,000 bushels of grain, to say nothing about the trade of Manitoba or the country south of the Northern Pacific railroad, or the valley of the upper Mississippi river.

"Months would be required to compile all the statistics that could be obtained bearing on these matters."

EXTRACT FROM THE REMARKS OF ALONZO RICHMOND, DELIVERED  
BEFORE THE BOARD OF TRADE, APRIL 11TH, 1878.

*Trade Channels for the Red River Country.*

Only a few years ago little was known of the "Red River of the North" or of its valley. The region through which that river flows was thought to be cold, inhospitable and utterly worthless. Since the Northern Pacific railroad was constructed across the valley, farms have been opened and cultivation commenced, and it has been found that both soil and climate are favorable for the production of wheat, of a very superior quality, with heavy yields. It is now generally admitted that in this valley of the Red river and its connecting valleys, including hundreds of thousands of square miles of excellent lands, both in Canada and the United States, will be grown a large proportion of our supply of wheat for home use and export. All the wheat sent out of the Red river must come to the market in the east, down the lakes throughout the season when they are open for navigation. Why this must be so I will try to explain.

Moorhead, at the crossing of the Northern Pacific railroad, on the Red river, is an important town near the head of navigation, and, until the river is connected with Lake Superior by slack water and canals, will be a great wheat depot. The distance from it to Duluth, on Lake Superior, is two hundred and fifty miles. By the line of the railroads, from Moorhead to St. Paul is two hundred and fifty miles, and the latter city is at the head of steamboat navigation on the Mississippi. The distance from St. Paul to the mouth of the Mississippi is two thousand and seventy miles, and from the mouth of that river to the latitude of New York, which is the course of all shipping bound to northern Europe, it is fully two thousand miles more. From Duluth to New York, by the route of the lakes, the Erie canal and the Hudson river, the distance is about fourteen hundred miles. Navigation on the lakes and the canal is open as late in the fall and as early in the spring as on the upper Mississippi. The period of navigation is nearly the same on the upper Mississippi,

above Galena, the great lakes and the Erie canal. The lake and canal route has the advantage of uniform and greater depth of water for navigation, which tends to greater speed and despatch, while that of the Mississippi is deficient in uniformity of depth, and frequently there are less than two feet of water over the sand bars below St. Paul in the very season of the year when business is most active. Aside from the disadvantages of the fluctuations in the depth of the water in the Mississippi, its mouth is more than two thousand miles further from the ports in Europe, where our exports of grain have to go, than it is from New York to the same ports. While it is but seventeen hundred miles from Moorhead, through the lakes and canal, to New York, it is twenty-three hundred and thirty miles from that place to the Gulf of Mexico, and that by a river navigation, which is more costly than the lake navigation. The total distance from Moorhead to Liverpool, by the course of the railroad, lakes, canal, Hudson and the ocean, is four thousand seven hundred miles; by railroad to St. Paul, the Mississippi, the Gulf of Mexico and the ocean, it is seven thousand three hundred and thirty miles. There being a difference in favor of the northern route of about two thousand six hundred and thirty miles, and a gain of over half in time. The climate of New Orleans is known to be unfavorable to the safe handling of corn and wheat, and besides it is dreadfully unhealthy in the fall season for northern people. It may be concluded that this Mississippi project for carrying the grain of the north-west to the eastern or European market belong to the category of the visionary; such as the great Mississippi and Atlantic double track, steel rail, freight railroad, projected by well-meaning theorists who are not strong in practical science. "A shingle put into the Mississippi at St. Paul," says an authority of that city, "will float down the river and up the gulf stream to New York." Give it time enough and it will float along to the coasts of Iceland and Norway, and as far as the gulf stream will take it, but no man of sense would propose to send grain or other exports to market in any such way.

Things do not drift now, they go right ahead. Another reason why the Mississippi route will not be a success is that the lines of railroads running east and west, and terminating at the western lake ports, will find it a necessity to work in the interests of the northern route. It can be easily demonstrated, and I think the managers now fully admit, that the prosperity of the lives of these railroads depends on their availing themselves of the cheap water route of the lakes and canal. By so doing they can become paying roads. Deny them the use of this water route and their ruin is inevitable.



## TRIP OF THE STEAMER EMMA AND CONSORT HATHAWAY, FROM BUFFALO TO NEW YORK, JULY 11TH TO JULY 20TH, 1879.

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Believing that a careful test of the economy of moving grain by the Illinois system would be of use in solving the problem of canal transportation, and being anxious to learn by experience just what the obstacles are in the way of all boats navigating the canals, I made arrangements with Captain Hathaway of the steamer Emma and her consort, to carry from Buffalo to New York the engineers in my department and myself, with the apparatus necessary to determine the power developed by the engine, the velocity of the currents, etc.

The trip was commenced on the 11th and ended on the 21st of July.

The vessels used on this occasion are operated on what is known as the Illinois system, which consists in coupling boats and propelling and steering them, by an engine, wheel and rudder, in the rear boat.

These are of the forms ordinarily used, except that the stern of the steamer is formed to admit of a propeller wheel, 8 feet in diameter and of 6 feet pitch.

This is run by a simple condensing engine, of about twenty horse power, with a single vertical cylinder connecting directly to the crank of the propeller wheel, and steam is furnished by an upright tubular boiler, provided with a coal magazine, like the feeder of a base-burning stove, requiring to be filled once in six or eight hours.

The coal bunker is on deck, and holds a supply for four or five days.

The machinery and appurtenances add about fifteen tons to the dead weight of the boat, and occupy so little space as to reduce the cargo only by that amount.

The Emma and her consort the Hathaway were loaded with wheat at Buffalo on the morning of July 11th, the former having seven thousand three hundred bushels, or two hundred and seventeen tons, and the Hathaway seven thousand eight hundred bushels, or two hundred and thirty-four tons.

They were examined by the official inspector at Buffalo and Black Rock, and the draft found to be exactly six feet.

The following diary presents the principal incidents of the trip, and shows the practical workings of this system.

*July 11* — We left Slip No. 3, Buffalo, at 1 o'clock and 40 minutes, P. M., and reached the head of the combined locks at Lockport at 12:35 A. M., of Saturday July 12th. The detentions between Buffalo and Lockport were, at Black Rock lock, twenty-six minutes, at Tonawanda, eleven minutes, and at Sulphur Springs Guard lock, five minutes, total forty-two minutes.

The running time was therefore ten hours and thirteen minutes, and the distance thirty miles and thirty-six one-hundredths of a mile.

Average speed two miles and ninety-one one-hundredths of a mile per hour, average easterly current fifty-seven one-hundredths of a mile per hour.

Consumption of coal from Buffalo to Lockport, five hundred and ninety-five pounds or nineteen and six-tenths of a pound per mile.

*July 12* — We started from the Lockport locks at 2:29 A. M., and reached the change bridge at Rochester at 1:47 A. M., Sunday, July 13th.

The detentions were at combined locks Lockport, one hour and fifty-four minutes, at Albion, one hour and ten minutes, for supplies, and at Hulberton to land carpenter, eleven minutes. Insufficient force and bad lights at Lockport occasioned detention and hazard. The amount of coal consumed during the day was eighteen hundred and fifty pounds, or thirty-one and two-tenths of a pound per mile. Deducting the detentions, the average progress of the boats was two miles and sixty-four one-hundredths of a mile per hour, and the eastward current, thirty-nine one-hundredths of a mile per hour.

The distance traveled was fifty-eight miles and twelve one-hundredths of a mile.

*July 13* — At 2:40 P. M., we uncoupled the boats at the Rochester aqueduct, and towed the consort to lock No. 66, the sharp curvature making it difficult to move them through this portion of the canal while coupled.

We passed Pittsford at 7:35 A. M., and Fairport at 12:9 P. M., and at 1:55 P. M., ran aground four and a half miles west of lock 61, delaying us five minutes.

At 3:45 P. M., we ran aground near Frear's bridge, a mile and a quarter west of lock 61, where we lay about two hours, and at 6:23 P. M., grounded again near Macedon bridge, where we lay three hours and fifty minutes, the water at this end of the level being more than a foot too low.

At 12 o'clock, midnight, we passed Clark's bridge, a mile east of the lower Macedon lock (No. 60). The detentions during July 13th aggregate for lockages, two hours and fifty-seven minutes, and aground five hours and forty-five minutes, leaving the running time from the Rochester change bridge to Clark's bridge, thirteen hours and a half.

The detentions from lockage at the Macedon lock are unnecessarily increased by leaving the bottom of the berme lock so narrow, that it is impossible for loaded boats of the standard size and model to pass.

The distance traveled over during the day was twenty-eight miles and fifty-four one-hundredths of a mile. Computing the boat's rate from the running time, the average speed was two and eleven one-hundredths miles per hour, the average easterly current, twenty-two one-hundredths of a mile per hour.

The consumption of coal was twelve hundred and seventy pounds, or forty-four and five-tenths pounds per mile.

*July 14* — We lay aground from 4:48 to 6:30 A. M., three miles west of lock 59, and again from 8:12 A. M. to 8:30 A. M., one-half a mile west of lock 59, the water in the level between lock 59 and 60 being more than eight inches low. On this level we passed a number of boats, that as we were informed had been aground all night.

The low water in the eastern part of the level between Macedon and Pittsford, and as far east as lock 59, was doubtless, in a great measure, due to the contraction of the channel made by leaving the berme stop gates closed, at Cartersville and Bushnell's Basin, and at the latter place, by attempting to strengthen a weak place in the embankment, by depositing gravel in the channel. This obstruction should be removed, and the bank strengthened by depositing brush and stone on the outer slope.

We passed Lyons at 12:34 P. M., Clyde at 4:42 P. M., and reached the Richmond aqueduct at 11:54 P. M. The total detentions were two hours and six minutes by lockages, and two hours and twenty minutes aground. Running time, nineteen hours and twenty-eight minutes, and the distance passed over, thirty-three miles and twenty-five one hundredths of a mile, speed, one mile and seven-tenths of a mile per hour.

The amount of coal burned was seventeen hundred and fifty-three pounds. The amount of coal per mile, fifty-two and eight-tenths pounds. This disproportionate consumption of coal and the low rate of speed, were both due to the increased resistance from running the boats so near the bottom of the canal, in the low water mentioned, and to the working of the screw, while trying to move the boats when aground.

*July 15* — We passed port Byron at 3:04 A. M., Weedsport at 6:30 A. M., where we stopped an hour for coal, and reached lock No. 51 at 9:30 A. M., when we were detained an hour and a half waiting for boats to get through the lock. Passed lock 50 at 7:35 P. M. and slowed for lock 49, at Syracuse, at 10:30 P. M.

We were detained two hours and twenty-six minutes in locking through the three locks at Syracuse.

We were aground six minutes on the wall bench on the Jordan level, and ten minutes on the Syracuse level. The water on the

Jordan level was four inches low, and two inches high on the Syracuse level.

The detentions from lockages aggregate five hours and forty-nine minutes. Five of these locks have an eastward lift, creating a strong current opposed to the direction of the eastward bound boats, requiring the expenditure of much time and power to tow boats into and out of them.

Nearly one-quarter of the whole time taken to lock through all the locks on the canal, seventy-two in number, was consumed at the five locks, having an eastward lift, Nos. 47, 48, 49, 51, and 52. A great saving of time could be effected at these locks, by the use of appropriate power and apparatus, for working the gates and valves, and for assisting boats in and out of them, such as have been in use for nine years on the Delaware and Raritan canal, and which I recommended to the State in my last annual report.

Deducting all of the above-mentioned detentions, the running time for July 15 was eighteen hours and four minutes. The distance run was thirty-three miles and one-third of a mile. Average speed, one mile and eighty-three one-hundredths of a mile per hour. The adverse current westward was nineteen one-hundredths of a mile per hour.

Amount of coal consumed, fifteen hundred and forty pounds; coal consumed per mile, forty-six and two-tenths pounds.

*July 16*—We left lock 47 at Syracuse, at 1:12 A. M., passed Canastota at 12:07 P. M., and arrived at Newville bridge at 11:52 P. M.

The water was eight inches too low at the head of lock 47, at Chittenango five inches too low, and nearly at grade at Higginsville.

The crest of the spillway at Chittenango is five inches too low, and should be raised.

There were no detentions during the day, and the running time was twenty-two hours and forty minutes; distance run forty-three miles and sixty-seven one-hundredths of a mile. Average rate one mile and ninety-three one-hundredths of a mile per hour; average adverse westerly current sixteen one-hundredths of a mile an hour.

Coal consumed, eighteen hundred and ninety pounds, or forty-three and two-tenths pounds per mile.

*July 17*—We arrived at Utica at 6:17 A. M., where we stopped two hours and one-half making preparations to determine co-efficients of the current meter.

We passed lock 45, at Frankfort, at 12:37 P. M., and arrived at lock 34 (Mindenville) at 12:17 A. M. The detentions were, for twelve lockages, three hours and twenty minutes; taking water at Whitesboro twenty-two minutes, and at Utica two hours and thirty minutes; in all, five hours and fifty-four minutes, leaving the running time eighteen hours and thirty-three minutes. The distance run was forty-three miles and thirty-four one-hundredths of a mile; average rate two miles and thirty-four one-hundredths of a mile per hour; average current eastward thirty-nine one-hundredths of a mile per hour.

Coal consumed, fourteen hundred and seventy pounds; coal consumed per mile, thirty-three and nine-tenths pounds.

*July 18*—We left lock 34 at 12:59 A. M. and passed Fultonville at 12 noon, and arrived at lock 23 at 11:49 P. M. There were no detentions except for lockages. The time taken for the eleven lockages was five hours and fourteen minutes. The running time was, therefore, eighteen hours and eighteen minutes; the distance run, forty-six miles and eighty-four one-hundredths of a mile. Average rate, two miles and fifty-six one-hundredths of a mile per hour; average easterly current, forty-nine one-hundredths of a mile per hour. Coal consumed, sixteen hundred and ten pounds; coal consumed per mile run, thirty-four and three-tenths pounds.

Considerable delay was experienced at locks 32 and 23, on account of having to pass both boats through the same lock, the companion lock in each case is too narrow at the bottom to pass a loaded boat of the standard size.

The old bevels should be cut out of these locks, as well as out of the berme upper Macedon lock. The water in the upper part of the fourteen-mile level, between locks 29 and 30, was about one-half a foot too low, owing to the failure to bring the crest of the spillway to the grade established by the division engineer.

*July 19*—We left lock 23 at 12:18 A. M. and arrived at lock 18, Cohoes, at 10:45 A. M., and locked into the Hudson river at West Troy at 3:25 P. M. We stopped at Congress street dock, Troy, from 3:38 P. M. to 4:40 P. M., taking in coal and supplies. Started from Troy at 4:40 P. M., arriving in Albany at 6:40 P. M.

The boats were towed by a tug most of the way from Troy to Albany, in order to measure their tractive resistances. The detentions from lock 23 to West Troy, for lockages, were five hours and twenty-eight minutes; running time, ten hours and eighteen minutes; distance run, twenty-five miles and six-tenths of a mile; average speed, two miles and forty-eight one-hundredths of a mile per hour; average easterly current, forty-two one-hundredths of a mile per hour; coal consumed, seven hundred and seventy pounds, or thirty-six and one-tenth pounds per mile.

*July 20 and 21*—Leaving Albany July 19th, at 7:48 P. M., we passed Hudson July 20th, at 6:25 A. M.; Peekskill July 21st, at 6 A. M.; Yonkers at 2:30 P. M.; Castle Garden at 8:08 P. M., and arrived in slip No. 6, East river, 8:40 P. M. The amount of coal consumed between Albany and New York was forty-six hundred and forty-five pounds, or thirty and ninety-six one-hundredths pounds per mile run. The running time was forty-eight hours and fifty-two minutes, or three miles and one-tenth of a mile per hour.

The detentions on the canal aggregate, for lockages, twenty-six hours and fifty-one minutes; for low water, eight hours and twenty-one minutes; for supplies, two hours and forty-two minutes; and on account of experiments, two hours and forty minutes; and in the river for supplies, one hour and three minutes; and on account of experiments, one hour and twenty minutes, making the total

running time eight days and twelve hours, or, including lockages, nine days fourteen hours and a half. This is nearly one-third less than the average running time of horse boats.

It must be borne in mind that the detentions on the canal owing to the lack of water upon some of the levels were increased by the eel grass, which, at this season of the year, checks the flow and makes it more difficult to keep the water at its proper stage.

The superintendents in charge were busy, at the time of our passage, in cutting out the eel grass, and since that work has been completed the boatmen will have a channel more free from obstructions. It therefore may be said that our detentions were, at least, equal to those which would usually delay the passage of boats.

The total consumption of coal was eight and seven-tenths tons, and for the round trip, the boats carrying a return cargo of one hundred and thirty tons each, the total amount would not exceed seventeen tons.\*

These details with regard to every day's experience are given to show that the trip was not made under circumstances peculiarly favorable as to the state of the water, or the condition of the channel, or the time consumed in passing locks, and that these boats met with all the usual detentions on the route from Buffalo to New York.

The difference in the amount of coal used, and the speed gained, upon different parts of the canal, puts in a strong light the loss, or gain, of both time and cost, from a scant or full supply of water, and makes clear the great gain which would grow out of the plan urged in my last report, by giving more depth to the channel, and also by making use of the surplus water at the locks to aid the passage of boats. The canal from Buffalo to Lockport is nine feet deep and from Lockport to Rochester will average nearly eight feet.

The average time of the Emma and her consort between these points, after deducting the effect of the current, was two miles and two-tenths of a mile per hour with an expenditure of fuel of twenty-five and seven-tenths pounds of coal to the mile, while from Clark's bridge to the Richmond aqueduct, on July 15th where the water was less than seven feet deep, the speed was only one mile and seven-tenths of a mile per hour, and the coal burned, fifty-two and eight-tenths pounds per mile, or thirty per cent less speed with more than twice as much fuel. If the canal throughout was as deep as it is from Buffalo to Rochester, the running time could have been reduced at least seventeen hours, with two tons less coal, or with the same amount of coal, I have no doubt that a saving in time of twenty-four hours could have been effected.

The delay from lockages amounted to nearly twenty-seven hours, or twenty-two and a half minutes to a lock, this great detention was caused in part by the accumulation of boats above and below the locks, but the great cause of the delay was from the length of

\* \* The actual consumption of coal by these boats during the five trips made this season since this experimental one was 15 1-5 net tons, the down cargoes being the same as that carried on this trip and the up cargoes averaging 130 tons to each boat.

time it took to force the boats into uplift locks against the current. With power on the locks run by the waste or feed water, the gates and valves could be operated, and the boats drawn in and out of the locks in one-half the time.

A great saving would also be made in the life of the gates and masonry. As the locks are now operated, the lock-tenders are forced, in order to gain time, to allow one of the head gates to be closed by the current caused by opening a valve at the lower end of the lock, this brings the gate against the miter-sill with such force as to destroy the timber, and injure the masonry, causing both gates and lock to leak. A saving of half the time in lockages would be thirteen hours gained between Buffalo and New York, this added to the twenty-four hours gained from an increase of one foot in depth, would make a saving of a day and a half between Buffalo and New York. This would enable the steamer and consort to make two more trips, and the horse boats one more trip, because even now a gain of four or five days will often enable a boat to finish a trip near the end of the season. The facts developed by this trip are sufficient to determine, with considerable accuracy, the commercial value of this system of towage.

To render its advantages and disadvantages more obvious, we will compare its operations with horse towing. Suppose, before the opening of navigation, the owner of four horse boats determines to use two of them by this plan and to tow the other two by horses. He must convert one of his boats into a steamer, which, including machinery and carpenter work and coupling lines and apparatus, will cost \$2,750 or \$2,800. He has, however, eight mules or horses, harness, etc., to sell, which would reduce his original investment to about \$1,500, and which sum represents the difference in capital between the two boats operated by steam and those operated by horses. Our observations clearly show that the rate of speed attained by the steamer and consort in the Erie canal and on the Hudson river is enough higher than that of horse towed boats to insure nine trips to the former, under circumstances which enable the latter to make but seven trips.\*

The cost of running the horse boats, from a mean of estimates furnished me by Messrs. Beadle, Case and Pease, and published in my last annual report, corrected to conform to the present rate of river and harbor towing, would be \$5,647.64, including interest, reserve fund, etc. The cost of running the steamer and consort, as shown by our experiments, and by the books of Capt. Hathaway, on the same basis, would be as follows:

Interest on investment (\$8,500).....	\$595 00
Reserve, to replace boat and machinery in ten years..	573 06
Repairs, five per cent.....	425 00
Insurance on boat, one-half per cent.....	42 50
Brought forward.....	\$1,635 56

\* The quickest round trip made by the Emma and consort the past season was twenty-one days, including the time of loading and unloading and all other detentions.

Carried forward.....	\$1,835 56
Captain .....	420 00
Two engineers.....	385 00
Two steersmen.....	350 00
One deckhand.....	140 00
Board.....	630 00
Coal.....	535 50
Oil, waste and sundries.....	76 50
Lines .....	30 00
Towing.....	90 00
Pilotage.....	72 00
Commission.....	288 00
Insurance.....	450 00
Wharfage and incidentals.....	68 00

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\$5,165 56

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Cost of running two horse boats.....	\$5,647 64
Cost of running steamer and consort.....	5,165 56

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Saving in favor of steamer and consort..... \$482 08

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Showing that two boats can be run on this plan, making nine trips, for nearly five hundred dollars less than by horses making seven trips, due allowance being made for interest, reserve, etc. The tonnage, assuming that the westward cargo is only one hundred and thirty tons for both steamer and consort, is as follows:

Steamer and consort, east.....	$445 \times 9 = 4005$ tons.
Steamer and consort, west.....	$130 \times 9 = 1170$ tons.

---

Total..... 5175 tons.

---

Cost per ton,  $\frac{\$1,175.56}{5175} = 99 \frac{81}{100}$  cents.

Cost per ton for horse boats, as per statement of Messrs. Beadle, Case and Pease,  $1.25 \frac{82}{100}$ .

Saving in favor of steamer and consort,  $25 \frac{81}{100}$  cents per ton.

Cost per bushel, as per statement of Messrs. Case, Beadle and Pease.....  $5 \frac{82}{100}$  cents.

Cost by steamer and consort,

Bushel of wheat moved 495 miles..... 2.99

Tolls, Buffalo, to New York..... 1.04

Elevator charges, New York..... 50

Trimming, New York..... 11

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$4 \frac{84}{100}$  cents.

Making a saving of.....  $\frac{88}{100}$  cents.)

Assuming that the average amount received per bushel during the season was five cents, and taking off two cents for tolls, elevator



charges in New York and contingencies, leaving three cents, the steamer and her consort would make over the horse boats the amount that they would carry on the two additional trips at three cents a bushel, together with the four hundred and eighty-two dollars, the saving in cost of running, etc., during the season, amounting to thirteen hundred and eighty-two dollars, without considering the return cargoes.

The appended table shows, in detail, for each successive period of about six hours employed in making this trip through the canal; the ratio of the cross section of the channel passed over bears to the immersed section of the boat; the observed facts as to rate and direction of current; velocity of boat through the water; consumption of fuel; number of revolutions and slip of screw, as well as the theoretical resistance due to the respective velocities attained and section of channel traversed, computed by the formula for propulsion of vessels in narrow channels (published and discussed in my last annual report), and the power developed by the engine, determined from the indicator cards taken during each interval.

TABLE showing results of experimental trip of Steamer Emma and Consort, July, 1879 :

	DISTANCE.		TIME.		Current. Miles per hour.	Velocity. Miles per hour.	Ratio of section of boat to channel.
	Over ground, miles.	Through water, miles.	Including de- tentions. Hours. Min.	Running time. Hours. Min.			
Slip No. 3 to Black Rock.....	4 10	.....	h. 1	m. 4	.....	2.25	.....
Black Rock to Tonawanda.....	8 09	6.831	3 4	32 3	.....	2.47	Infalling.
Tonawanda to Penfield.....	11 61	10.555	1 11	32 15	.....	2.57	.....
Penfield to Hitchin's Bridge.....	6 26	4.018	1 58	55 4	.....	2.64	.....
Lockport to Watson's Bridge.....	11 76	9.060	1 1	55 4	.....	2.70	.....
Watson's Bridge to Latlin's Bridge.....	16 13	12.776	5 54	33 53	.....	2.74	.....
Latlin's Bridge to Miner's Bridge.....	12 41	10.910	5 54	33 53	.....	2.78	.....
Miner's Bridge to Finley's Bridge.....	14 61	12.840	6 51	53 8	.....	2.83	.....
Finley's Bridge to Lock No. 63.....	11 09	9.815	5 51	53 8	.....	2.88	.....
Lock No. 63 to Main St., Fairport.....	12 06	10.650	6 39	38 8	.....	2.93	.....
Fairport to Frear's Bridge.....	6 17	6.910	5 38	38 33	.....	2.97	.....
Frear's Bridge to Clark's Bridge.....	8 14	7.866	6 33	37 49	.....	3.03	.....
Clark's Bridge to Swazy's Bridge.....	8 28	7.866	6 30	37 49	.....	3.03	.....
Swazy's Bridge to Pruine's Bridge.....	6 67	4.102	5 33	47 10	.....	3.04	.....
Pruine's Bridge to Clyde.....	9 00	8.444	6 53	59 5	.....	3.04	.....
Clyde to Seneca Aqueduct.....	11 86	11.825	8 53	38 3	.....	3.04	.....
Seneca Aqueduct to Hamilton's Bridge.....	7 53	7.035	6 8	38 3	.....	3.04	.....
Hamilton's Bridge to Jordan.....	6 23	7.035	6 8	38 3	.....	3.04	.....
Jordan to Amboy.....	11 33	12.071	5 58	43 43	.....	3.04	.....
Amboy to Lock No. 48.....	7 04	8.444	5 38	43 43	.....	3.04	.....
Lock No. 48 to Manlius.....	11 33	12.071	6 4	51 4	.....	3.04	.....
Manlius to Canastota.....	12 51	13.826	6 54	54 4	.....	3.04	.....
Canastota to Higginsville.....	12 51	13.826	6 54	54 4	.....	3.04	.....
Higginsville to Newville.....	12 51	13.826	6 54	54 4	.....	3.04	.....
Newville to Ulster.....	12 51	13.826	6 54	54 4	.....	3.04	.....
Ulster to East's Culvert.....	11 19	9.444	5 58	38 3	.....	3.04	.....
East's Culvert to Lock No. 40.....	11 19	9.444	5 58	38 3	.....	3.04	.....
Lock No. 40 to Lock No. 34.....	10 75	9.444	5 58	38 3	.....	3.04	.....
Lock No. 34 to Canajoharie.....	13 12	13.127	6 46	43 43	.....	3.04	.....
Canajoharie to Bridge No. 32.....	11 65	9.444	5 58	38 3	.....	3.04	.....
Bridge No. 32 to Lock No. 27.....	11 17	9.444	5 58	38 3	.....	3.04	.....
Lock No. 27 to Lock No. 23.....	11 17	9.444	5 58	38 3	.....	3.04	.....
Lock No. 23 to Lock No. 20.....	11 17	9.444	5 58	38 3	.....	3.04	.....
Lock No. 20 to Lock No. 18.....	10 59	9.444	5 58	38 3	.....	3.04	.....
Lock No. 18 to West Troy.....	4 04	8.588	4 43	45 45	.....	3.12	.....

\* This velocity is the rate through the water, and the consumption of coal per mile is computed on the distance passed through the water, while in the report these computations are based on speed and distance over the ground.

TABLE showing results of experimental trip, etc.—Continued.

Revolutions of screw per minute.	Resistances in pounds, computed by Formula $(R = \frac{1859 \text{ hp}^2}{v - 6})$	Coal consumed per mile.	Slip of screw, per cent.	Power developed by the engine, Horse power.	Remarks.
53.2	1048.	† 35.2	34.	9.55	These observations show 66 per cent useful power and a consumption of 6.9-10 pounds of coal per hour, per indicated horse power—10.4-10 pounds of coal per hour, per useful H. P.
53.2	978.	35.2	33.	10.81	
53.1	1108.	35.2	35.	9.77	
53.8	1060.	36.0	35.	9.77	
53.0	1108.	36.0	35.	9.77	
53.4	1238.	36.0	38.	12.46	
53.4	1064.	36.0	38.	12.46	
53.4	991.	36.0	38.	12.46	
53.4	1067.	45.0	38.	12.46	
53.4	981.	46.1	38.	12.46	
53.4	1237.	46.1	38.	12.46	Revolution counter out of order during this interval.
53.4	768.	53.1	38.	12.46	
53.4	778.	53.1	38.	12.46	
53.4	809.	53.1	38.	12.46	
53.4	1109.	53.1	38.	12.46	
51.3	1012.	40.1	45.	9.50	
51.3	1274.	40.1	45.	9.50	
51.0	1256.	40.1	45.	9.43	
51.0	1059.	40.1	45.	9.43	
51.0	1013.	40.1	45.	9.77	
51.0	1451.	43.0	45.	10.43	The power developed and slip of screw are exaggerated on some of these sections by fruitless turns of screw in locks.
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	These observations show 67 per cent useful power and a consumption of 7.8-10 pounds of coal per hour, per indicated H. P.—11.6-10 pounds of coal per hour per useful H. P.
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	The power developed and slip of screw are exaggerated on some of these sections by fruitless turns of screw in locks.
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	
53.0	1451.	43.0	45.	10.43	

\* The numerical coefficient above (1859) was determined from experiments with similarly coupled boats.  
† The method of coaling rendered it impossible to determine the amount of coal burned in any short interval.

*STATEMENT of property paying tolls first cleared on the canals, going east and west, during the years of 1878 and 1879, showing the quantity, in tons.*

## GOING EAST.

YEARS.	The forest, product of wood.	Agriculture, product of animals.	Vegetable food.	All other agricultural products.	Manufac- tures.	Merchandise.	Other articles.	Total tons.
1878.....	1,329,243	585	1,894,756	21	69,803	5,893	684,048	3,984,379
1879.....	1,316,698	8	1,905,496	.....	74,990	20,985	731,978	3,940,066
GOING WEST.								
1878.....	24,394	631	9,748	532	132,405	131,649	843,199	1,142,518
1879.....	41,042	244	10,710	.....	151,471	215,161	923,624	1,347,452

*STATEMENT of property on the free list first cleared on the canals, going east and west, during the years 1878 and 1879, showing the quantity, in tons.*

## GOING EAST.

YEARS.	The forest, product of wood.	Agriculture, product of animals.	Vegetable food.	All other agricultural products.	Manufac- tures.	Merchandise.	Other articles.	Total tons.
1878.....	10,509	2,831	3,193	606	501	1	.....	17,537
1879.....	11,066	623	5,237	11,493	4,380	.....	.....	33,134
GOING WEST.								
1878.....	4	796	5,091	2,551	17,854	531	.....	1 26,836
1879.....	41	963	11,336	3,814	24,072	925	.....	41,651

TABLE showing results of experimental trip, etc.—Continued.

	Revolutions of screw per minute.	Resistances in pounds, computed by Formula ( $R = \frac{1359 \pi r^3}{r - 6}$ )	Coal con- sumed per mile.	Slip of screw, per cent.	Power de- veloped by the engine. Horse power.	Remarks.
slip No. 3 to Black Rock	52.2	1048.	25.2	34.	9.55	These observations show 66 per cent useful power and a consumption of 6 9-10 pounds of coal per hour, per indicated horse power—10 4-10 pounds of coal per hour, per useful H. P.
Black Rock to Tonawanda	54.0	978.	35.2	33.	10.81	
Tonawanda to Pendleton	54.0	978.	35.2	33.	9.77	
Pendleton to Hitchin's Bridge, Lockport	53.1	1108.	35.2	35.	9.70	
Lockport to Watson's Bridge	53.8	1090.	36.0	33.	9.77	Revolution counter out of order during this interval.
Watson's Bridge to Lattin's Bridge	53.0	1108.	36.0	33.	9.77	
Lattin's Bridge to Miner's Bridge	53.0	1268.	36.0	38.	12.46	
Miner's Bridge to Finley's Bridge	56.4	1094.	36.0	38.	12.46	
Finley's Bridge to Lock No. 63	56.4	981.	45.0	.....	.....	The power developed and slip of screw are exaggerated on some of these sections by fruitless turns of screw in locks.
Lock No. 63 to Main St., Fairport	56.4	1097.	46.1	.....	.....	
Fairport to Fear's Bridge	56.4	881.	46.1	.....	.....	
Fear's Bridge to Clark's Bridge	56.4	1357.	46.1	.....	.....	
Clark's Bridge to Swazy's Bridge	56.4	778.	53.1	.....	.....	These observations show 67 per cent useful power and a consumption of 7 8-10 pounds of coal per hour, per indicated H. P.—11 6-10 pounds of coal per hour per useful H. P.
Swazy's Bridge to Prune's Bridge	56.4	809.	53.1	.....	.....	
Prune's Bridge to Clyde	56.4	1109.	53.1	.....	.....	
Clyde to Seneca Aqueduct	51.2	1013.	53.1	45.	9.50	
Seneca Aqueduct to Hamilton's Bridge	51.2	1274.	40.1	43.	9.77	The power developed and slip of screw are exaggerated on some of these sections by fruitless turns of screw in locks.
Hamilton's Bridge to Jordan	51.2	1274.	40.1	43.	9.77	
Jordan to Amboy	51.0	1286.	40.1	43.	9.43	
Amboy to Lock No. 48	51.0	1028.	40.1	45.	9.43	
Lock No. 48 to Manlius	52.0	1013.	43.0	43.	9.77	These observations show 67 per cent useful power and a consumption of 7 8-10 pounds of coal per hour, per indicated H. P.—11 6-10 pounds of coal per hour per useful H. P.
Manlius to Canastota	53.0	1461.	43.0	43.	10.43	
Canastota to Higginsville	55.4	1468.	43.0	43.	12.40	
Higginsville to Newville	55.0	1486.	43.0	41.	12.07	
Newville to Utica	50.9	1280.	40.0	43.	9.07	The power developed and slip of screw are exaggerated on some of these sections by fruitless turns of screw in locks.
Utica to Kast's Culvert	54.0	1286.	40.0	43.	10.81	
Kast's Culvert to Lock No. 40	60.0	1440.	40.0	47.	13.81	
Lock No. 40 to Lock No. 34	58.0	1028.	40.0	44.	9.98	
Lock No. 34 to Canajoharie	59.0	1274.	50.0	44.	12.36	The power developed and slip of screw are exaggerated on some of these sections by fruitless turns of screw in locks.
Canajoharie to Bridge No. 92	61.0	1287.	50.0	43.	14.07	
Bridge No. 92 to Lock No. 27	53.0	1087.	50.0	43.	10.81	
Lock No. 27 to Lock No. 23	54.0	1028.	50.0	49.	10.81	
Lock No. 23 to Lock No. 20	54.0	1190.	50.0	46.	11.07	
Lock No. 20 to Lock No. 18	54.0	1190.	50.0	46.	11.07	
Lock No. 18 to West Troy	55.3	1390.	50.0	49.	13.14	

\* The numerical coefficient above (.1859) was determined from experiments with similarly coupled boats.

† The method of coaling rendered it impossible to determine the amount of coal burned in any short interval.

STATEMENT of property paying tolls first cleared on the canals, going east and west, during the years of 1878 and 1879, showing the quantity, in tons.

## GOING EAST.

YEARS.	The forest product of wood.	Agriculture, product of animals.	Vegetable food.	All other agricultural products.	Manufactures.	Merchandise.	Other articles.	Total tons.
1878.....	1,329,243	585	1,994,753	21	69,303	5,883	934,948	3,984,379
1879.....	1,316,688	8	1,865,493	.....	74,880	20,986	731,978	3,940,066
GOING WEST.								
1878.....	21,364	631	9,748	532	122,405	131,949	948,189	1,142,518
1879.....	41,043	244	19,710	.....	151,471	215,161	928,884	1,347,459

STATEMENT of property on the free list first cleared on the canals, going east and west, during the years 1878 and 1879, showing the quantity, in tons.

## GOING EAST.

YEARS.	The forest product of wood.	Agriculture, product of animals.	Vegetable food.	All other agricultural products.	Manufactures.	Merchandise.	Other articles.	Total tons.
1878.....	10,509	2,831	3,193	806	501	1	.....	17,587
1879.....	11,086	526	5,297	11,493	4,890	.....	.....	33,184
GOING WEST.								
1878.....	4	736	5,091	2,561	17,854	531	.....	26,886
1879.....	41	863	11,986	3,514	24,072	925	.....	41,661

*TOTAL TONS of each class of articles that came to the Hudson river from the Erie canal from 1837 to 1879, both inclusive, were as follows :*

YEARS.	Products of the forest.	Agriculture.	Manufac- tures.	Merchandise.	Other articles.	Total.
1837.....	181,644	145,718	8,350	356	51,438	387,506
1838.....	198,964	174,025	7,229	258	38,773	419,249
1839.....	185,728	155,082	6,686	405	38,366	386,267
1840.....	140,584	204,423	5,655	26	25,627	467,315
1841.....	237,520	205,920	12,778	142	16,160	532,520
1842.....	156,691	287,928	10,406	143	24,981	480,149
1843.....	239,585	338,968	23,542	134	33,116	635,345
1844.....	356,874	371,300	36,057	236	42,974	807,411
1845.....	420,190	430,454	43,184	206	65,556	959,590
1846.....	407,848	612,585	34,561	222	52,054	1,107,270
1847.....	445,975	875,365	25,755	690	83,467	1,431,252
1848.....	406,982	674,194	24,514	296	73,351	1,184,337
1849.....	442,106	736,009	24,340	205	64,064	1,266,724
1850.....	597,956	875,569	23,065	201	57,884	1,554,675
1851.....	552,345	856,127	29,872	247	70,086	1,508,677
1852.....	627,466	915,367	35,874	4,891	61,101	1,614,699
1853.....	835,304	895,672	37,098	6,302	77,062	1,851,438
1854.....	738,367	826,025	27,080	6,135	105,086	1,702,693
1855.....	569,080	753,277	23,159	9,400	65,799	1,420,715
1856.....	509,405	974,311	20,207	7,369	75,838	1,587,130
1857.....	503,428	516,755	23,825	8,115	65,076	1,117,199
1858.....	638,650	857,350	36,928	6,067	57,692	1,496,687
1859.....	776,855	505,004	23,518	5,176	140,780	1,451,333
1860.....	814,393	1,297,227	20,943	3,164	140,385	2,276,061
1861.....	499,324	1,871,723	24,406	1,358	122,798	2,449,609

TOTAL TONS of each class of articles that came to the Hudson river, etc.—Continued.

YEARS.	Products of the forest.	Agriculture.	Manufao- tures.	Merchandise.	Other articles.	Total.
1862.....	706,592	2,087,347	19,589	1,948	101,618	2,917,094
1863.....	682,215	1,809,911	25,944	2,674	126,945	2,647,689
1864.....	716,017	1,243,067	56,223	1,826	129,501	2,146,634
1865.....	627,039	1,302,711	33,896	1,181	113,484	2,078,361
1866.....	808,050	1,487,068	44,940	2,083	181,523	2,523,664
1867.....	837,581	1,099,933	50,020	1,934	236,594	2,228,112
1868.....	911,588	1,187,501	63,421	2,388	213,674	2,378,572
1869.....	873,431	1,055,932	67,267	1,947	259,112	2,267,689
1870.....	956,139	1,024,458	72,345	2,832	234,924	2,290,698
1871.....	816,802	1,539,243	78,177	2,747	211,908	2,648,877
1872.....	890,140	1,480,580	60,993	3,456	235,236	2,670,405
1873.....	925,535	1,396,236	39,237	4,587	219,760	2,585,355
1874.....	755,201	1,429,544	27,590	6,240	251,722	2,470,297
1875.....	490,000	1,133,322	51,786	1,769	237,765	1,914,942
1876.....	570,755	882,391	17,511	2,131	272,532	1,745,320
1877.....	623,788	1,336,884	33,493	3,474	300,369	2,298,008
1878.....	650,082	1,813,255	34,377	4,802	328,874	2,831,790
1879.....	682,670	1,692,385	29,336	12,586	129,029	2,546,002



*Freight charges by Erie canal from 1861 to 1879.*

DATE.	Freight, not including tolls, per bushel of wheat—Buffalo to Albany.			Tolls per bushel of wheat—Buffalo to Albany.			Freight, not including tolls, per bushel of wheat—Buffalo to New York.		
	c.	m.	fr.	c.	m.	fr.	c.	m.	fr.
1861.....	9	0	8	5	1	7	10	5	8
1862.....	8	1	3	6	2	1	9	6	3
1863.....	7	6	8	6	2	1	9	1	8
1864.....	11	0	7	6	2	1	12	5	7
1865.....	9	1	3	6	2	1	10	6	3
1866.....	9	2	5	6	2	1	10	7	5
1867.....	7	9	8	6	2	1	9	4	8
1868.....	7	9	4	6	2	1	9	4	4
1869.....	8	6	0	6	2	1	10	1	0
1870.....	6	6	2	3	1	0	8	1	2
1871.....	8	0	2	3	1	0	9	5	2
1872.....	8	5	0	3	1	0	10	0	0
1873.....	6	9	7	3	1	0	8	4	7
1874.....	5	5	1	3	1	0	7	0	1
1875.....	4	4	4	2	0	7	5	9	4
1876.....	3	1	5	2	0	7	4	6	5
1877.....	4	8	6	1	0	3	6	3	6
1878.....	3	4	6	1	0	3	4	9	6
1879.....	4	4	3	1	0	3	5	9	3

*Average Yearly Lake Freights.*

DATE.	CHICAGO TO BUFFALO.			CHICAGO TO OSWEGO.		
	Wheat per bushel.			Wheat per bushel.		
	c.	m.	fr.	c.	m.	fr.
1861.....	11	5	3	10	5	6
1862.....	10	4	9	9	6	0
1863.....	7	5	1	6	5	6
1864.....	9	5	8	8	9	4
1865.....	9	7	8	9	0	7
1866.....	13	4	0	11	4	7
1867.....	6	6	7	5	4	3
1868.....	7	1	4	6	0	5
1869.....	6	8	1	6	2	7
1870.....	5	8	8	5	4	3
1871.....	7	6	2	7	0	6
1872.....	11	1	5	10	3	0
1873.....	7	6	2	6	9	4
1874.....	4	0	3	3	6	7
1875.....	3	4	2	3	0	8
1876.....	3	1	1	2	6	0
1877.....	3	5	7	3	2	3
1878.....	3	1	7	2	5	9
1879.....	4	7	2	4	2	8

# EASTERN DIVISION.

## ANNUAL REPORT OF THE DIVISION ENGINEER, NEW YORK STATE CANALS, 1879.

Hon. HORATIO SEYMOUR, JR., *State Engineer and Surveyor* :

SIR — I have the honor to transmit herewith my annual report for the fiscal year ending September 30, 1879.

Yours, respectfully,

E. SWEET, JR.,  
*Division Engineer.*

### DESCRIPTION OF THE EASTERN DIVISION.

The limits of this division remain as fixed by the Canal Board in February, 1876.

It embraces the Erie canal from Albany to east line of Oneida county, and the whole of the Champlain canal, including their basins, side-cuts, river improvements and feeders.

Their navigable extent is as follows :

	Miles.
Erie canal, Albany to Utica.....	106.243
Port Schuyler side-cut.....	.35
Albany basin.....	.77
Mohawk feeder, north side Little Falls.....	.50
Champlain canal, including Waterford side-cut and Cohoes and Saratoga dams.....	66.00
Pond above Troy dam.....	3.00
Glen's Falls feeder and pond.....	12.
Total.....	<u>188.863</u>

### *Extent of Feeders not Navigable.*

	Miles.
Mohawk river at Rexford flats.....	.39
“ “ south side, Little Falls.....	.19
“ “ at Rocky rift.....	3.92
Schoharie creek.....	.63
Total.....	<u>5.13</u>

*Water Supply.*

The portion of the Erie canal between Utica and lock 39, at Little Falls, is supplied through the Rome level from the upper water sheds of the Mohawk and Black rivers, a portion of which is stored in artificial reservoirs, all upon the middle division. The supply from Steel's creek, at Ilion, is too uncertain to be taken into account.

The amount of water required to supply the full locking

	Cub. ft. per min.
capacity of this section of the canal is .....	5,500
For losses from filtration, evaporation and waste are ....	4,300
<b>Total .....</b>	<b>9,800</b>

	Cub. ft. per min.
The available supply is estimated at. ....	12,700
From Little Falls to Mindenville the losses from filtration, evaporation and waste are.....	2,000
The supply through feeder at Little Falls is estimated at..	12,000
From Mindenville to Rexford Flats the losses from evaporation, filtration and waste are.....	11,650
The supply from the Rocky Rift feeder, at Mindenville, is estimated at.....	10,600
And at Schoharie creek, from Schoharie creek feeder....	6,800
From Rexford Flats to Albany the losses from evaporation, filtration and waste, including the supply of the weighlock at West Troy and Albany.....	8,600
The supply from the Rexford Flats feeder is estimated at..	11,000
And from the Mohawk river, at Cohoes.....	6,500

These estimates are derived from the report of D. C. Jenne, who, as division engineer of this division, investigated the subject of water supply in 1892, with reference to the project then under consideration of converting the Erie into a ship canal.

The fact that climatic changes are diminishing the permanence, if they do not materially affect the aggregate amount of this water supply, and that a certain amount of current is demanded for the most expeditious and economical movement of canal tonnage, induces me to recommend a careful re-examination and remeasurement of this water supply.

The water supply of the Champlain is ample and secure beyond any probable contingency. Its summit level controls the entire drainage of the Hudson above Glen's Falls, which is supplemented on the north, at Fort Ann, by the waters of Wood creek, and on the south, at Fort Miller, by the same drainage of the Hudson between that point and Glen's Falls, and at Cohoes by the waters of the Mohawk.

. In my last annual report to you, I took occasion to discuss the question of beneficial currents, and to deduce feed-water tables for

this division of the canals, conforming to the laws established in that discussion.

Though the mathematical reasoning and deductions which determine the limitations sought are correct, there is an error in the velocity assumed for west-bound boats which vitiates the accuracy of the feed-water tables, and which I wish now to correct.

The erroneous velocity of west-bound boats was arrived at by computing their resistance on the theory that their stream lines were the same as those of the loaded boats, and neglecting the law of equal work in equal times, which is of vital importance, because the animals move faster than the boat in the former case and slower in the latter.

Applying the law of resistance (determined by our recent experiments and enunciated in my last annual report) to boats of average model and carrying a cargo of sixty tons, we find that a velocity of 2.18 miles per hour, in the ordinary channel without current, requires the expenditure of 40,000. foot pounds of mechanical work, or the same amount of work that is expended in moving a fully loaded boat in the same channel without current at the rate of 1.40 miles per hour. If the canal has a current in the direction of heavy traffic the same work expended in towing will evidently move the heavy boat slower and the light boat faster through the water.

If we represent by  $R$  the resistance and by  $v$  the velocity of the loaded boat through the water, and by  $R'$  the resistance and  $v'$  the velocity of the light boat, and by  $c$  the rate of the current ( $v$ ,  $v'$  and  $c$  being in feet per minute) the work performed will be represented by the following equations:

$$W = 40,000 = R(v + c.)$$

$$W' = 40,000 = R'(v' - c)$$

$R$  and  $R'$  are from the law of resistance made up of constant factors multiplied by  $v^2$  and  $v'^2$  respectively. Representing the constant part of  $R$  by  $a$ , and that of  $R'$  by  $a'$  we have:

$$40000. = a v^2 (v + c.) \quad (1.)$$

$$40000. = a' v'^2 (v' - c.) \quad (2.)$$

For the case under consideration:

$$a = .0224 \text{ and } a' = .00565.$$

The most beneficial current I have heretofore shown to be expressed by the formula ( $c = \frac{v' - v}{2}$ ), from which follows  $v + c = v' - c$  (3.)

This condition suffices for the solution of the equations (1.) and (2.), from which we find the most beneficial current  $c = .59$  mile per hour,  $v = 1.20$  miles per hour and  $v' = 2.38$  miles per hour.

The running time of these boats, without current from Buffalo to tide-water and return, would be east 246 hours, west 158 hours, or 404 hours for round trip. With a current of .59 miles per hour their running time would be 193 hours both east and west, or 386 hours, showing a saving of 53 hours in the transfer of the principal cargo, and of 18 hours in making a round trip.

To produce a close approximation to this rate of current requires no change in the system of distribution recommended in my last report except to increase the quota of the Little Falls feeder from 3,000 to 10,000 feet per minute for which quota I have corrected the feed-water table for the Erie canal and have revised the feed-water table for the Champlain canal to provide for the best current similarly determined for that canal.

Extensive changes are required in the heights of waste weir crests, caps of aqueducts, and other surfaces over which the water now wastes, in order to make the distribution thus indicated, or in fact, any economical distribution of water practicable. These changes are as follows :

The crest of Ferguson's aqueduct should be raised two-tenths of a foot, and that of the Frankfort aqueduct thirty-five one-hundredths of a foot. The Ilion aqueduct crest should be raised three-tenths, and that of the aqueduct at Mohawk thirty-four one-hundredths of a foot. The crest of the aqueduct over Castle creek is twenty-seven one-hundredths of a foot too low, and of the Fort Plain aqueduct thirty-five one-hundredths of a foot.

The caps of Spraker's aqueduct should be raised sixty-five one-hundredths of a foot, and Lasher's and Yates' aqueducts forty-four one-hundredths and fifty-two one-hundredths of a foot respectively. Hoffman's aqueduct should be flushed two-tenths of a foot, and the waste-weir at Schenectady and the Mohawk aqueduct at Rexford Flats each raised twenty-five one-hundredths of a foot.

To maintain the proper stage of water with these spillways at their present elevations, would waste feed water at the rate of more than 30,000 cubic feet per minute and be productive of currents too strong on some portions of the canal and too weak on others for the economical navigation of the canal.

Intelligent observation during one season will determine what modifications are desirable, if any, in the theoretical quotas of feed which we have given above.

Before the opening of navigation last season the height at which the water should be maintained on each level and the proper elevation of these various spillways were conspicuously marked at the head of each lock, and upon the masonry of the several aqueducts and waste-weirs.

The appended tables show the area of opening required in the gates of each feeder to produce the proper rate of feed at heads varying from one foot to four feet at the various bulk-heads of the Erie and Champlain canals.

The actual heads the operator can, of course, readily determine by measurement at any time.

*Feed-water Table, Erie Canal.*

HEAD AT BULK-HEAD.	OPENING REQUIRED AT BULK-HEAD			
	Little Falls.	Rocky Rift.	Schoharie. Creek Aqueduct.	Bexford Flats.
	<i>square feet.</i>	<i>square feet.</i>	<i>square feet.</i>	<i>square feet.</i>
1 foot 0 inches ...	33.67	15.16	20.22	13.48
1 foot 3 inches ...	30.00	13.50	18.00	12.00
1 foot 6 inches ...	27.47	12.37	16.50	11.00
1 foot 9 inches ...	25.50	11.47	15.30	10.20
2 feet 0 inches ...	23.83	10.73	14.30	9.54
2 feet 3 inches ...	22.50	10.12	13.50	9.00
2 feet 6 inches ...	21.33	9.60	12.80	8.52
2 feet 9 inches ...	20.20	9.10	12.12	8.08
3 feet 0 inches ...	19.30	8.69	11.58	7.72
3 feet 3 inches ...	18.60	8.37	11.16	7.44
3 feet 6 inches ...	18.00	8.10	10.80	7.20
3 feet 9 inches ...	17.33	7.80	10.40	6.94
4 feet 0 inches ...	16.83	7.58	10.10	6.74

*Feed-water Table, Champlain Canal.*

HEAD AT FEEDER BULK-HEAD.	OPENING REQUIRED AT BULK-HEAD GATES.			
	Wood Creek.	Glen's Falls.	Northumber- land.	Cohoes.
	<i>square feet.</i>	<i>square feet.</i>	<i>square feet.</i>	<i>square feet.</i>
1 foot 0 inches ...	8.42	48.03	30.94	15.17
1 foot 3 inches ...	7.50	42.75	27.56	13.50
1 foot 6 inches ...	6.87	39.21	25.42	12.50
1 foot 9 inches ...	6.37	36.35	23.47	11.57
2 feet 0 inches ...	5.96	33.69	21.81	10.73
2 feet 3 inches ...	5.62	32.07	20.61	10.12
2 feet 6 inches ...	5.32	30.36	19.42	9.50
2 feet 9 inches ...	5.07	28.94	18.51	9.00
3 feet 0 inches ...	4.77	27.23	17.60	8.64
3 feet 3 inches ...	4.65	26.66	17.05	8.37
3 feet 6 inches ...	4.50	25.65	16.50	8.10
3 feet 9 inches ...	4.34	24.74	15.71	7.81
4 feet 0 inches ...	4.21	24.00	15.43	7.58

### *Extraordinary Repairs.*

Construing this class of repairs to include all improvements in the canals and their structures involved in changes of plan or material the extraordinary repairs made upon this division during the period covered by this report are of two classes, viz.:

1st. Those authorized by the canal board and performed by contract.

2d. Those performed by the superintendent of public works without authority from the canal board.

The works of the first class were as follows:

#### *Erie Canal.*

Building a wrought-iron swing bridge, 108 feet in length, across the Erie canal at St. Lawrence street, Albany, commenced April, 1879, and opened for traffic July, 1879.

#### *Champlain Canal.*

1st. Rebuilding of stone at the wooden guard lock, on the north side of the Mohawk river, at Waterford, including 290 lineal feet of retaining wall along the river approach to the lock.

2d. Building seven berme bridge abutments on section 1 of the Champlain canal.

3d. Extending and partially rebuilding the arch culvert near Flynn's lock.

4th. Partially rebuilding the double arch culvert at Mechanicville.

5th. Extending and partially rebuilding Bell's culvert, on the Champlain canal, near Ft. Edward.

6th. Building nine berme bridge abutments on section 2 of the Champlain canal.

7th. Building ten berme bridge abutments on section 3 of the Champlain canal.

All these works were begun in October, 1878, and were completed in May, 1879.

The principal facts relating to these several works are exhibited in annexed table No. 2. A like quantity of work of equal excellence has not been secured upon the canals of the State for so small an expenditure of money in many years.

To the second class belong the following works performed by day labor during the year:

1st. Building bulk-heads and sluices on changed plans at locks 1, 5, 12 and 13, of the Glen's Falls feeder.

2d. Inserting breast walls and re-building the ends of locks 12 and 13 of that feeder.

3d. Substituting iron pipe for stone masonry at Blake's culvert, near Ft. Edward.

4th. Deepening and straightening channel of Bond's creek, authorized by chapter 272, Laws of 1879.

5th. Constructing three new pieces of canal across bends in the Whitehall level of the Champlain canal.

All these works were finished during the year except the last which is now in progress.

The engineers of this division have attended to the engineering details of this work except the improvement of Bond's creek which was undertaken without our knowledge.

I have been unable to obtain the cost of these works, but give below the items and quantities of the work and materials embraced in those planned, laid out and supervised by us.

Estimated amount of work done in partly rebuilding locks 12 and 13, and waste-weirs and sluices at locks 1, 5, 12 and 18, of Glen's Falls feeder and rebuilding Blake's culvert.

- 8,620 cubic yards excavation of earth.
- 1,370 cubic yards excavation of old masonry.
- 2,265 cubic yards embankment.
- 489 cubic yards puddling.
- 1,071 cubic yards lock masonry laid.
- 624 cubic yards sluice (coursed rubble in cut) and ret. wall.
- 250 cubic yards dry rubble.
- 155 cubic yards loose stone in cribs.
- 47,050 feet, B. M., hemlock timber in foundation and docking.
- 21,500 feet, B. M., pine timber in foundation and docking.
- 2,510 feet, B. M., chestnut timber in foundation and docking.
- 2,240 feet, B. M., oak timber in foundation and docking.
- 4,600 feet, B. M., oak timber in Yates.
- 12½ tons cast-iron pipe for culvert.
- 266 cubic yards new lock stone.
- 226 cubic yards new rubble.
- 286 cubic yards sand.
- 960 barrels cement.

The engineering details relating to these works have been attended to by the assistants having charge of the works ordered by the canal board, all whose services are charged to extraordinary repairs.

### *Ordinary Repairs.*

The navigation of the canal on this division has suffered but two important interruptions during the past season; one from a break of the Champlain canal at Mechanicsville and the other from a break in the Erie canal near Mindenville. The former occurred May 7th and was caused by a leak through the unfinished embankment on the berme end of the Mechanicsville culvert resulting in washing out the embankment about fifty feet in length and over twenty feet in depth causing three days' detention to navigation.

The Mindenville break occurred July 2d and washed out about sixty feet of the tow-path embankment to a depth of seven feet



below canal bottom, detaining navigation five days. It was caused by a neglected plank drain through the tow-path where the break took place.

The principal ordinary repairs made upon this division during the year ending October 1, 1879, may be summarized by sections as follows:

Section 1, Erie canal, includes the Erie canal from Albany to the west end of the lower Mohawk aqueduct, fourteen miles, and the portion of the Champlain canal from its junction with the Erie to the Mohawk river at Cohoes, two and a half miles.

Besides the clearing out of the canal the principal repairs done on this section consist in constructing two lock piers at lock No. 17, reconcreting, replanking lock No. 9, rebuilding about four hundred and fifty feet of vertical wall on the levels between locks 6 and 7, and between locks 7 and 8, excavating rock from the sharp curve in the south tow-path of the level between locks 16 and 17, and breaking it upon the tow-path between lock 18 and Crescent, inserting twenty-three new lock gates, rebuilding wooden farm bridge No. 30 and constructing coal houses at the Cohoes State shop.

The repairs most needed on this section are the renewal of the upper dock timbers between Lawrence street and Exchange street in Albany and between Schenectady street and Union street, West Troy, the rebuilding of the retaining wall to the south side of the east approach to the Island park bridge raising, repaving and draining the State dock between the West Troy basin and the Hudson river, south of the upper side cut, eleven new lock gates, new lock piers at the head of locks 12, 13 and 15, and at the foot of locks 8, 9, 10, 11 and 14, and the partial rebuilding of the waste-weir near lock No. 3.

Section 2, Erie canal. This section extends from the lower Mohawk aqueduct to lock No. 27, a distance of twenty-nine miles. Besides the cleaning of the channel the principal repairs made have been the replanking and reconcreting the bottoms of locks Nos. 19, 21, 23 and 25, inserting four new gates in lock 24, three gates in lock 23, two gates in lock 22, three gates in lock 21, and one gate in lock 20, building one new lock pier at lock 20; building one new lock pier at lock 22; building one new lock pier at lock 23 and raising the tow-path with gravel quarry chips and sand from lock 19 to Crescent and from Schenectady to lock 23.

The following repairs are needed on this section: Wooden farm bridges Nos. 34, 44, 45, 72 and 74 and the wooden road bridge No. 67 need rebuilding.

The berme abutment of bridge No. 44 has become undermined so as to lean toward the canal and should be rebuilt. One new gate is needed at lock 19, a new pier at the foot of lock 20, and one at the head of lock 26. The bottoms of locks 20 and 27 should be reconcreted and replanked. The waste-weir near lock 20 is in need of extensive repairs.

In order to make it possible to maintain a proper depth of water

on the Schenectady level, the trunk of the upper Mohawk aqueduct should be flushed three inches and the timber walls along the high embankment west of Schenectady should be raised a foot. Much of the tow-path between locks 24 and 25 and between locks 25 and 27 needs raising.

Section 3. This section extends from lock 27 to lock 34, a distance of thirty-six miles. The principal repairs made outside the channel have been replanking and reconcreting lock No. 29, inserting eight new lock gates, building three wooden bridges across the Rocky Rift feeder, protecting piers of Schoharie aqueduct with rip-rap, cleaning culvert and aqueduct channels and raising about five miles of tow-path.

The repairs most needed are the raising of the tow-path over the greater part of the levels between locks 27 and 28 and between locks 29 and 33, repairing the bulk-head walls and inserting new gates at both ends of the Schoharie creek feeder, hanging four new gates at the head of lock 32, four lower gates at lock 33 and lock 30, and two lower gates at lock 28. Wooden farm bridges Nos. 92, 103, 105, 108, and 126 should be immediately rebuilt and the woodwork of the iron chord road bridge No. 94 should be renewed.

The wooden tow-path bridge across the feeder at Mindenville needs rebuilding and the tow-path drawbridge across the dry-dock entrance at Fultonville should be replaced by a more suitable and practicable structure. The waste-weir at lock 33 and the berme abutment of bridge No. 104, should be rebuilt.

Section 4, Erie canal, extends from lock No. 34 to the east line of Oneida county, a distance of twenty-nine miles.

The principal repairs made upon this section consisted in thoroughly cleaning out the channel and raising the tow-path wall and bank over about 2 miles of the level west of lock 45, raising tow-path between locks 35 and 40, putting in two new tumble gates at the head of lock 44, one lower gate in lock 45 and one in lock 36, two upper gates in lock 35, and two upper gates in lock 41. Rebuilding wooden farm bridge 128 and renewing the woodwork in the iron chord road bridge No. 130 and in enlarging and improving the State yard and shops at Mohawk.

The repairs needed on this section are the replanking and reconcreting of the bottom of lock 45, renewing the tumble gates of that lock, inserting two new lower gates at lock 40, building a new pier at the head of lock 37, rebuilding wooden farm bridges No. 166, and 170, completing the bottoming out of the nine-mile level, west of lock 45, and raising the tow-path most of the way from lock 40 to lock 44.

Section 1 of the Champlain canal extends from the Waterford guard-lock to the guard-lock on the north side of the Hudson river at Northumberland including the Waterford side-cut and the upper pool of the Troy dam from Troy to Waterford, whole length thirty miles.

The principal ordinary repairs made on this section during the

year were rebuilding eighty-eight feet and repairing two hundred and fifty feet of the apron of the State dam at Troy; displaced and injured by ice, entirely rebuilding two waste-weirs, one below Flynn's lock, and one below Hewitt's lock; rebuilding wooden bridges Nos. 6, 11, 18, 19, 26, 32, 34, 38, 45, and 67; rebuilding tumble gates at locks Nos. 5, 8 and 9, inserting two new upper gates in the lower side-cut lock at Waterford; rebuilding three hundred linear feet of docking near Fisher's bridge, and an equal amount in Waterford and raising the tow-path of the upper end of the Schuylerville level.

### *Repairs needed.*

Four new gates are needed in the Waterford weigh-lock and two in the guard-lock at Northumberland. The timber work in the long pier separating the Troy dam from the approach to the sloop lock is rotten and should be renewed. The docking should be renewed and the tow-path raised from lock No. 4 to Waterford, and from the guard-lock at Northumberland to Billing's boat yard.

The stringer bridge across the Cemetery creek at Waterford should be converted into an arch culvert. The level between locks 7 and 8 should be deepened a foot to prevent the flooding of lock 7 and the banks of the level, which are all too low to permit carrying a proper stage of water.

The waste-weirs at Bemis Heights and Coveville should be rebuilt with lengthened spillways to safely provide for the large amount of side drainage coming into the level, upon which they are located, in heavy storms.

The raising of the tow-path upon the 16 mile level should be completed.

Section 2.—This section extends from the north guard-lock at Northumberland to Dunham's Basin, three miles north of Fort Edward, and includes the Glen's Falls feeder—length 22 miles.

The principal ordinary repairs have been inserting ten new gates in the Glen's Falls feeder locks, and two in the lock at Fort Edward.

Rebuilding twelve wooden bridges.—Rebuilding wing walls of the Fort Edward aqueduct and Cold Spring culvert, and raising six miles of tow-path between locks 18 and 15.

### *Repairs needed.*

Two new gates at lock 13.—Raising and straightening the banks over the two culverts next south of Bell's culvert on the Fort Edward level, which will necessitate the rebuilding and extension of the ends of the masonry or substitution of iron pipe. Rebuilding the berme abutment of the bridge at East street, Fort Edward, and bridge and berme abutment near Bell's culvert.

The remaining six miles of tow-path between Fort Edward and lock 11 should be raised.

## SECTION No. 3—CHAMPLAIN CANAL.

This section extends from Dunham's Basin to Whitehall, a distance of 21 miles.

The principal ordinary repairs were:

Rebuilding breast-wall of lower lock at Whitehall.

Rebuilding 400 lineal feet of vertical wall in cement on the Whitehall level.

Rebuilding ten wooden bridges.

Constructing crib behind walls of Dunham's Basin waste-weir.

Raising seven miles of tow-path on Wood creek and five miles north from Dunham's Basin.

*Repairs needed.*

The upper combined lock at Fort Ann has settled and should have its foundations examined and thoroughly repaired.

The rebuilding of Bartholomew's bridge, authorized by the last legislature, should be proceeded with.

Bridge Number 132, "Johnson's," should also be rebuilt.

The bermie abutment of the road bridge at Fort Ann is insecure and should be rebuilt. Both the waste-weirs on the Whitehall level need extensive repairs.

The channel between Boardman street bridge and the waste-weir has been narrowed by docks built upon the bermie side and should be widened on the tow-path and have a new tow-path wall of stone or timber.

*General recommendations.*

Besides the particular works I have above described, there are several of a general character which I have recommended in previous reports and which ought not longer to be neglected. Foremost among these is the preservation of the lock and other dimension masonry.

For nearly forty years this masonry has undergone the test of the severest climate and the severest use to which masonry of its class is ever subjected. The effect of wide and rapid variations of heat and humidity; of the countless shocks of rapidly closing gates and of moving boats, are seen in the open and ragged joints and loosened stones which are characteristic of nearly every lock on this division of the canal. This depreciation increases rapidly as the joints enlarge, permitting water to collect and freeze and leaks to become established and ultimately threatens the stability of the structures. The original mortar was not of the highest grade, and I am satisfied that this defect can now be permanently remedied by carefully caulking and pointing the joints with mortar made from neat Portland cement.

Next in importance to the preservation of the masonry structures is the proper maintenance of bridges, buildings, and other open air structures of iron and wood, which can only be secured by keeping them properly painted. Scarcely any of these structures have been

It is evidently false economy to permit this avoidable deterioration to continue.

The execution of the works above recommended will put the canals of this division in good condition.

The engineering work of this division during the past year has been in charge of E. Sweet, Jr., division engineer, and of W. S. Lasher, resident engineer.

Expended for ordinary repairs Erie canal.....	\$6,551	36
“ “ “ Champlain canal.....	1,974	57
“ “ extraordinary repairs Erie and Champlain canals.....	7,599	57

**Total expenditures..... \$16,125 50**

**E. SWEET, JR.,**  
*Division Engineer.*

TABLE No. 1.

*SHOWING the number and compensation of engineers employed on the Eastern Division of the New York State canals, together with the incidental expenses from October 1, 1878, to September 30, 1879, inclusive.*

## ORDINARY REPAIRS, ERIE CANAL.

NAME.	Rank.	Number of days.	Rate.	Amount.	Total.
E. Sweet, Jr.....	Division Engineer....	Salary.	\$2,400 00	\$1,600 00	
E. Sweet, Jr.....	Division Engineer....	Travel.	.....	302 61	
W. S. Lasher.....	Resident Engineer....	Salary.	2,000 00	1,333 32	
W. S. Lasher.....	Resident Engineer....	Travel.	.....	134 28	
C. L. Phelps.....	Assistant Engineer...	28	5 00	140 00	
H. C. Parsons.....	Leveler .....	313	4 50	1,408 50	\$4,918 71
<i>Incidental Expenses.</i>					
Stationery .....				\$169 71	
Fuel .....				26 23	
Light .....				6 75	
Office rent .....				250 00	
Postage and telegraph. ....				79 70	
Miscellaneous.....				1,100 26	1,632 65
Total, Erie canal .....				.....	\$6,551 36

TABLE No. 1—Continued.  
ORDINARY REPAIRS, CHAMPLAIN CANAL.

NAME.	Rank.	Number of days.	Rate.	Amount.	Total.	
E. Sweet, Jr. ....	Division Engineer ....	Salary.	\$2,400 00	\$800 00	\$1,974 57	
E. Sweet, Jr. ....	Division Engineer ....	Travel.	.....	251 09		
W. S. Lasher. ....	Resident Engineer ....	Salary.	2,000 00	666 68		
W. S. Lasher. ....	Resident Engineer ....	Travel.	.....	256 80		
EXTRAORDINARY REPAIRS.						
Henry Gould .....	Assistant Engineer ...	313	\$5 00	\$1,565 00	6,567 00	
John R. Kaley .....	Assistant Engineer ...	237	5 00	1,185 00		
Thomas H. Stryker .....	Assistant Engineer ...	208	5 00	1,040 00		
Thomas H. Stryker .....	Leveler .....	53	4 50	238 50		
George Dinsmore .....	Rodman .....	261	3 50	913 50		
Thomas A. Paterson .....	Rodman .....	171	3 50	598 50		
Fred. G. Fay .....	Rodman .....	144	3 50	504 00		
Fred. G. Fay .....	Chainman .....	41	2 50	102 50		
Walter Myres .....	Chainman .....	168	2 50	420 00		
Incidentals.						
Miscellaneous .....				.....		1,032 57
Total, Champlain canal .....				.....	\$9,261 57	

TABLE NO. 2.

*STATEMENT showing amount of work done under the supervision of the Engineer department on extraordinary repairs under contract upon Eastern Division of the New York State canals for the fiscal year ending Sept. 30th, 1878.*

## ERIE AND CHAMPLAIN CANALS.

CHARACTER OF WORK.	Estimated cost.	Amount done in fiscal year.	Whole amount done.	Amount remaining to be done.
Constructing wrought-iron swing-bridge in the city of Albany, provided for by chapter 88 of the Laws of 1879.....	\$4,268 55	\$5,652 76	\$5,652 76	Completed and settled.
Rebuilding of stone the wooden guard-lock north side of Mohawk river at Waterford; also 290 ft. retaining wall; chap. 202 of Laws of 1878.....	27,614 12	16,569 46	16,569 46	do
Constructing (7) seven berme bridge abutments on section 1; chap. 202, Laws of 1878.....	5,616 05	3,682 60	3,682 60	do
Partially rebuilding culvert near Flynn's lock on section 1; chap. 202 of the Laws of 1878.....	2,093 02	1,547 84	1,547 84	do
Partially rebuilding double arch culvert at Mechanicville on section 1; chap. 202 Laws of 1878.....	4,527 05	3,208 07	3,208 07	do
Constructing nine (9) berme bridge abutments on section 2; chap. 202 Laws of 1878.....	6,994 00	5,129 12	5,129 12	do
Constructing ten (10) berme bridge abutments on section 3; chap. 202, Laws of 1878.....	6,454 80	5,562 93	5,562 93	do
Partially rebuilding Bell's culvert on section 2; chap. 202, Laws of 1878.....	1,836 00	1,386 97	1,386 97	do



# MIDDLE DIVISION

OF

## NEW YORK STATE CANALS.

ANNUAL REPORT OF MARVIN PORTER, DIVISION ENGINEER, FOR THE  
FISCAL YEAR ENDING SEPTEMBER 30, 1879.

Hon. HORATIO SEYMOUR, Jr., *State Engineer and Surveyor* :

SIR — I have the honor to present my annual report upon the middle division of the State canals, for the fiscal year ending September 30, 1879.

The lengths of the navigable canals, river improvements and feeders are as follows :

	Miles.
Erie canal, from east line of Oneida county to south side of Wayne county .....	97-02
Chenango canal, part not abandoned, Utica, to first culvert south of Hamilton .....	31-00
Black River canal, Rome, to Lyon's Falls .....	35-38
Black River improvement, Lyon's Falls to Carthage .....	42-50
Oneida Lake canal, Durhamville to South Bay, Oneida lake, .....	5-30
Oswego canal, Syracuse to Oswego .....	38-00
Seneca River towing-path, Mud Lock to Baldwinsville .....	5-75
Baldwinsville side cut .....	0-75
Seneca River improvement, Baldwinsville to Jack's Reefs .....	11-75
Oneida River improvement, Three River Point to Brewerton ..	
Oneida lake .....	20-00
Cayuga and Seneca canal, Montezuma to Cayuga and Seneca lakes .....	22-77
Ithaca inlet, at Ithaca .....	2-00

### *Navigable Feeders.*

Limestone feeder, Erie canal to Fayetteville .....	0-80	
Butternut feeder, Erie canal to Dunlop's Mill .....	1-55	
Camillus feeder, Erie canal to Camillus .....	1-00	
Delta feeder, foot of lock 9, Black River canal to Delta, ..	1-38	
Black River feeder, Boonville, to head of pond at Forest Port .....	12-09	16-82
<b>Total .....</b>		<b>328-99</b>

LOCATION OF FEEDERS, showing the points where the waters from the feeders are taken into the canal.

*Long Level, from Lock No. 46 to Lock No. 47.*

NAME.	Distance from lock No. 46.	Distance between feeders.	Natural flow, cubic feet per minute.	From reservoirs, cubic feet per minute.
Oriskany feeder .....	6 miles.			6,000
Rome feeder .....	14 miles.	8 miles.		18,000
Oneida feeder .....	30 miles.	16 miles.	1,000	
Cowasselon feeder.....	31½ miles.	1½ miles.	200	
Chittenango feeder .....	41½ miles.	10 miles.		2,526 for 100 days.
Limestone feeder.....	50 miles.	8½ miles.	500	7,000 for 100 days.
Butternut creek feeder....	52 miles.	2 miles.	500	2,000 for 60 days.

Butternut Creek feeder to lock No. 47 is 3.957 miles.

Total length of long level is 55.957 miles.

"Short level" and "mile level" are fed from "long level."

"Syracuse level" and Oswego canal to Mud lock are fed from "long level" and "Jordan level."

*Jordan Level, from Lock No. 50 to Lock No. 51.*

NAME.	Distance from lock No. 50.	Distance between feeders.	Natural flow, cubic feet per minute.	From reservoirs, cubic feet per minute.
Camillus feeder .....	4 miles.		800	5,146 for 120 days.
Carpenter Brook feeder...	10 miles.	6 miles.	200	
Jordan feeder .....	18 miles.	8 miles.		8,776 for 120 days.

Jordan feeder to lock No. 51 is 1 $\frac{203}{1000}$  miles.

Total length of Jordan level, 14 $\frac{803}{1000}$  miles.

*Port Byron Level, from Lock No. 51 to Lock No. 52.*

NAME.	Distance from lock No. 51.	Distance between feeders.	Natural flow, cubic feet per minute.	From reservoirs, cubic feet per minute.
	Miles.	Miles.		
Putnam Brook feeder.....	3 36-100	4 14-100	200	
Owasco feeder.....	7 10-100		4,083	2,000

Owasco feeder to lock No. 52 is 0.693 miles.

Total length of Port Byron level, 7.793 miles.

*"Montezuma level"* is fed from Port Byron level and Lake Erie.

It will be seen from the above table that the greatest distance between any two feeders is from Rome to Oneida, while no part of the canal on this division is so much affected by the westerly winds as this portion of the long level. These winds retard the flow of the waters moving west from the feeder at Rome, making it difficult to maintain a uniform depth of water between Higginsville and Durhamville.

A remedy for this would be to construct a reservoir on the headwaters of the Cowasselon, as proposed in this report, which would secure a more uniform depth of water east and west of this feeder, and insure a supply on this part of the long level.

TABLE showing the channels through which the reservoirs are discharged and the amount each reservoir is supposed to contain in cubic feet.

NAME OF RESERVOIR.	Average area. Acres.	Depth. Feet.	Capacity. Cubic feet.	Channel through which dis- charged.	Where discharged.
Woodhull .....	1,118	18	876,601,440	Mohawk River and Black River Canal.	Long Level.
North Branch, filled twice a year.	277	28	337,851,360		
South Branch .....	372	26	431,312,320		
Sand Lake .....	306	15	199,940,400		
Kingsley Brook.....	113	20	98,445,600	Oriskany Feeder.	Long Level.
Hatch's Lake.....	134	10	58,370,400		
Eaton Brook .....	254	50	553,212,000		
Bradley Brook.....	134	25	145,926,000		
Leland Pond .....	173	8	59,287,040	Chittenango Feeder.	Long Level.
Madison Brook .....	235	45	460,647,000		
Erieville .....	340	21½	318,423,600		
Cazenovia Lake.....	1,778	4½	348,523,660		
De Ruyter .....	626	18½	504,468,360	Limestone Feeder.	Long Level.
Jamesville.....	240	16	170,000,000	Butternut Feeder.	Long Level.
Skaneateles Lake .....	8,320	6	2,174,515,200	Jordan Feeder.	Jordan Level.
Otisco Lake.....	2,200	10	784,000,000	Camillus Feeder.	Jordan Level.
Owasco Lake .....	6,800	5	1,481,040,000	Owasco Feeder.	Port Byron Level.

*Reservoirs and Feeders to the Erie canal.*

Kingsley brook, Eaton Brook, Hatch's lake, Bradly brook, Madison brook and Leland's pond reservoirs are located in the southern part of Madison county.

Oriskany dam, located one mile from the canal, needs some repairing, and the feeder, which was but partially widened last April, should be further enlarged to a capacity of 8,000 cubic feet per minute.

Woodhull and Sand lake, North and South lake reservoirs are located near the head waters of Black river, about fifty-two miles from Rome.

The Mohawk dam and feeder are in good repair.

Oneida creek feeder dam is located two and a half miles south of the canal. The banks of this feeder have been raised in the village of Oneida, but the channel between the village and canal is somewhat obstructed by mud deposits, and should be cleaned out before opening the canal for navigation, in 1880.

The Cowasselon feeder was bottomed out and widened to its original capacity, in April last. Should it become necessary to secure a better supply of water to the long level at any point between Rome and Chittenango, I would recommend the plan proposed by Hon. W. B. Taylor, late State engineer, in his report for 1864. A supply taken into the level at this place would maintain a better stage of water at all times than can now be had from the present sources.

*Erieville and Cazenovia Reservoirs, and Chittenango Feeder.*

The pavement and walls of the channel leading from the well house, and the channel leading from the spillway of Erieville reservoir are out of repair, and should be attended to at once, to secure them against accident.

The Cazenovia dam has been repaired the present season, and the channel between the lake and dam bottomed out. The channel of the feeder from the bulk-head to the canal was bottomed out to its original dimensions, in April last.

*De Ruyter Reservoir and Fayetteville Feeder.*

The reservoir is located sixteen miles south of the canal, and the feeder dam is located at Fayetteville.

The lowering of the channel between the dam at Tioughnioga creek and the reservoir has increased the supply from this source. The spillway of this reservoir should be repaired, and the dam at Fayetteville rebuilt the coming season.

*Jamesville Reservoir and Butternut Creek Feeder.*

This reservoir is located six miles south of the canal, and the feeder dam is located on the outlet two and a half miles from the

canal. The platform around the well house, at the reservoir dam, should be repaired, and the large blocks of stone in front of this dam removed, so that the water falling over the dam may pass directly into the channel, instead of flowing along the face of the dam to the well house, thereby cutting away the platform around said well house and endangering the structure.

Butternut creek or Orville feeder has been lengthened and improved during the fiscal year (according to map and plans submitted September 9, 1878), by constructing a new channel, from Dunlop's mill to the old spillway, forty-five chains above said mill, and a dam and bulk-head, constructed at the head of this new channel to control the hitherto waste waters from this spillway and economize the waters stored up in said reservoir, giving it additional value as a feeder to the west end of the long level. This gives the State entire control of the Jamesville reservoir.

This extension is spanned by one road and one farm bridge, both built this year. Lands appropriated for this improvement 6 $\frac{1}{2}$  acres.

#### *Otisco Reservoir and Camillus Feeder.*

This reservoir is located twelve miles south of the canal, and the dam and bulk-head are located on the creek leading from it, one and a half miles from the canal (at the head of the feeder). The reservoir dam is in good repair. The north wing of the bulk-head abutment has settled so much as to break the joints of the masonry; it should be repaired.

#### *Skaneateles Lake, Reservoir and Feeder.*

This lake reservoir is located ten miles south of the canal, and is controlled by a dam at the foot of the lake. The feeder dam is located near the canal, in the village of Jordan. Some further work should be done in filling up the sink-holes above the Hartlet paper mill. The walls between dam and canal have been repaired, and the channel cleaned out. The State should have entire control of this reservoir.

#### *Owasco Lake Reservoir and Port Byron Feeder.*

The reservoir dam is located about one and a half miles below the foot of the lake. Though built by the State, it is left for the most part of the time in the hands of the mill owners and the Auburn Water Works Company, who drew the lake down to low-water mark, as early as the first of September, since which time the only supply from this source has been the natural flow of the stream.

The feeder dam is located two miles south of the canal, just above Hayden's mill. To make this feeder available, it was bottomed out and (enlarged as recommended in my last report) from the dam to

the well house, whence the water is conducted through a syphon pipe to the canal. The bulk-head at the dam has been rebuilt on an improved plan.

Location of the waste-weir changed and a new one constructed in a better place, and in a more substantial manner and to more fully control the water, a new bulk-head was constructed in Hayden's race, at the east end of the State dam, and the necessary amount of land appropriated. The only claim for damages that can arise in this case will be the value of  $\frac{348}{1000}$  of an acre of land the State having paid for the mill power in a former appropriation.

*Locks on Middle Division.*

*Erie Canal.*

No.	Lift.	Direction.	No.	Lift.	Direction.
46	3.000	West.	50	7.872	West.
47	10.175	East.	51	5.580	East.
48	10.538	East.	52	11.417	East.
49	6.991	East.			

*Black River Canal.*

No.	Lift.	Direction.	No.	Lift.	Direction.	No.	Lift.	Direction.
1	10.0	North.	38	10.0	North.	75	10.0	North.
2	10.0	"	39	10.0	"	76	10.0	"
3	10.0	"	40	10.0	"	77	10.0	"
4	10.0	"	41	10.0	"	78	10.0	"
5	10.0	"	42	10.0	"	79	10.0	South.
6	10.0	"	43	10.0	"	80	9.0	"
7	10.0	"	44	10.0	"	81	9.0	"
8	11.0	"	45	10.0	"	82	9.0	"
9	12.0	"	46	10.0	"	83	9.0	"
10	11.0	"	47	10.0	"	84	9.0	"
11	11.0	"	48	10.0	"	85	10.0	"
12	11.0	"	49	10.0	"	86	11.4	"
13	8.0	"	50	10.0	"	87	10.0	"
14	8.0	"	51	10.0	"	88	10.0	"
15	8.0	"	52	10.0	"	89	10.0	"
16	10.0	"	53	10.0	"	90	10.0	"
17	8.0	"	54	10.0	"	91	10.0	"
18	10.0	"	55	10.0	"	92	10.0	"
19	8.0	"	56	10.0	"	93	10.0	"
20	10.0	"	57	10.0	"	94	10.0	"
21	10.0	"	58	10.0	"	95	10.0	"
22	10.0	"	59	10.0	"	96	10.0	"

*Black River Canal—Continued.*

No.	Lift.	Direction.	No.	Lift.	Direction.	No.	Lift.	Direction.
23	10.0	North.	60	10.0	North.	97	10.0	South.
24	10.0	"	61	10.0	"	98	10.0	"
25	10.0	"	62	10.0	"	99	10.0	"
26	10.0	"	63	10.0	"	100	10.0	"
27	10.0	"	64	10.0	"	101	10½	"
28	10.0	"	65	10.0	"	102	10½	"
29	10.0	"	66	10.0	"	103	4.0	"
30	10.0	"	67	10.0	"	104	10.0	"
31	10.0	"	68	9.0	"	105	10.0	"
32	10.0	"	69	9.0	"	106	11.0	"
33	10.0	"	70	9.0	"	107	11.0	"
34	10.0	"	71	10.0	South.	108	12.0	"
35	10.0	"	72	10.0	"	109	12.0	"
36	10.0	"	73	10.0	"			
37	10.0	"	74	10.0	"			

*New Onondaga Lake Canal.*

Six locks. Feet of lockage 62.

*Oswego Canal.*

No.	Lift.	Direction.	No.	Lift.	Direction.	No.	Lift.	Direction.
1	11.000	.....	7	5.866	.....	13	5.650	.....
2	11.000	.....	8	11.250	.....	14	9.250	.....
3	10.500	.....	9	7.250	.....	15	5.750	.....
4	9.680	.....	10	9.000	.....	16	8.666	.....
5		.....	11	11.666	.....	17	10.500	.....
6	7.000	.....	12	11.250	.....	18	9.250	.....
							11.330	11.33

*Cayuga and Seneca Canal.*

No.	Lift.	Direction.	No.	Lift.	Direction.	No.	Lift.	Direction.
1	7.28	.....	5	9.00	.....	9	10.00	.....
2	7.00	.....	6	9.60	.....	10	10.00	.....
3	10.00	.....	7	6.00	.....	11	3.00	.....
4	9.00	.....	8	5.70	.....			



*Erie Canal.*

Double stone lift-locks as follows:

No. 46, Utica,	downward going east,	8,000 feet lift.
" 47, at Syracuse,	upward going east,	10,175 "
" 48, at Syracuse,	upward going east,	10,538 "
" 49, at Syracuse,	upward going east,	6,991 "
" 50, at Geddes,	downward going east,	7,872 "
" 51, at Jordan,	upward going east,	5,580 "
" 52, at Port Byron,	upward going east,	11,417 "

One weigh-lock at Utica ; one weigh-lock at Syracuse.

*Aqueducts.*

Saugoit creek aqueduct.....	3 spans, 22 ft. each.
Oriskany creek aqueduct .....	4 " 22 "
Cowasselon creek aqueduct.....	2 " 20 "
Chittenango creek aqueduct.....	3 " 20 "
Limestone creek (or Manlius Centre) aqueduct..	3 " 20 "
Butternut creek (or Orville) aqueduct.....	3 " 20 "
Nine mile creek (or Camillus) aqueduct.....	4 " 31 "
Skaneateles creek (or Jordan) aqueduct.....	4 " 20 "
Cold Spring brook (or Centreport) aqueduct....	3 " 20 "
Owasco creek (or Port Byron) aqueduct.....	4 " 21 "
Crane brook aqueduct.....	3 " 20 "
Seneca river (or Montezuma) aqueduct.....	31 " 22 "

*Feeder Dams.*

Oriskany creek dam at Oriskany, wood.  
 Mohawk river dam, at Rome, stone.  
 Oneida creek dam at Oneida, wood.  
 Chittenango creek dam at Chittenango, wood.  
 Limestone creek dam at Fayetteville, wood.  
 Butternut creek dam at Orville, stone.  
 Nine mile creek dam at Camillus, stone.  
 Carpenter brook dam, between Memphis and Jordan, wood.  
 Skaneateles creek dam at Jordan, wood.  
 Owasco creek dam at Port Byron, wood.

*Culverts.*

35 stone arch culverts ; 2 stone box culverts ; 42 composite culverts.

*Waste-weirs.*

10 waste-weirs.

TABLE of State Bridges, Erie Canal, Middle Division, 1879.

No.	NAME.	Class.	PLAN.	Material.	Date of erection.	TRUSSES.		
						No.	Height, ft. in.	No. of panels.
1.	Green's road	Highway.	Cooper's wrought iron arch	Iron.	1874	2	8.10	7
2.	Starch factory, Utica	Highway.	Whipple	Wood	.....	3	6.7	6
3.	Clay street, Utica	Highway.	Wrought iron truss, taken from Garden street, Utica, Chenango canal	Wood	.....	2	7.4	8
4.	Broad street, Utica	Highway.	Whipple's cast iron arch	Iron	1879	2	10.1	9
5.	Catharine street, Utica	Highway.	Swartz's suspended cast iron arch	Iron	1886	2	7.9	6
6.	Fifth street, Utica	Highway.	Whipple's cast iron arch	Iron	1874	2	9.7	9
7.	John street, Utica	Highway.	Whipple's cast iron arch	Iron	1882	2	9.6	9
8.	Genesee street, Utica	Highway.	Whipple's cast iron arch	Iron	1882	4	9.1½	9
9.	Hotel street, Utica	Highway.	Whipple's lift iron truss	Iron	1874	5	16.1	7
10.	Sonoma street, Utica	Highway.	Whipple's cast iron arch	Iron	1885	2	8.4½	7
11.	Washington street, Utica	Highway.	Whipple's cast iron arch	Iron	1870	2	8.4½	7
12.	Broadway, Utica	Foot	Whipple's cast iron arch	Iron	1870	2	6.0	7
13.	Cornelia street, Utica	Foot	Whipple's iron chord	Wood	.....	2	5.8½	6
14.	Whitesboro street, Utica	Highway.	Simms' wrought iron truss	Iron	1853	5	9.0	6
15.	Breeze street, Utica	Foot	Suspension	Iron	.....	2	8.8½	7
16.	Schuyler street, Utica	Highway.	Whipple's cast iron arch	Iron	1870	2	9.10½	10
17.	Platt street, Utica	Highway.	Howe's truss	Wood	1873	2	16.1	10
18.	Smith's Farm, bridge gone	Private	.....	.....	.....	.....	.....	.....
19.	Utica and Whitesboro road	Highway	Bollman's iron truss	Iron	1855	3	7.3½	6
20.	Clinton street, Whitesboro	Highway	Bollman's iron truss	Iron	1851	2	7.4	6
21.	Westmoreland street, Whitesboro	Highway	Whipple's cast iron arch	Iron	1851	2	9.10	9
22.	.....	Highway	Whipple's cast iron arch	Iron	1858	2	9.1	9
23.	Watkins street, Whitesboro	Private	Whipple's wooden truss	Wood	.....	2	6.4½	6
24.	Bradley's road	Highway	Whipple's cast iron arch	Iron	1850	2	8.0	9
25.	Evans	Farm	Whipple's wooden truss	Wood	1876	2	6.0	6
26.	Christman's	Farm	Whipple's wooden truss	Wood	.....	2	7.2	6
27.	.....	Farm	Whipple's cast iron arch	Iron	1850	2	9.1½	9
28.	River street, Oriskany	Highway	Whipple's cast iron arch	Wood	.....	2	7.4	6
29.	Brinard's	Farm	Whipple's wooden truss	Wood	.....	2	6.8	6
30.	Parkhurst's	Farm	Whipple's wooden truss, iron chords	Wood	.....	2	6.8	6
31.	Kirley's	Farm	Whipple's wooden truss, iron chords	Wood	.....	2	7.1	6
32.	Murphy's road	Highway	Whipple's wooden truss	Wood	1876	2	6.8	6
33.	Clark's	Farm	Whipple's wooden truss	Wood	.....	2	7.1	6
34.	Stanwix road	Highway	Whipple's cast iron arch	Wood	.....	2	5.10	9
34½.	Over waste-weir on berme	Highway	Whipple's wooden truss	Iron	1855	2	10.0	9
35.	.....	.....	Whipple's wooden truss	Wood	.....	2	5.0	4

TABLE of State Bridges — (Continued.)

No.	NAME.	Class.	PLAN.	Material.	Date of erection.	Clear span, ft. in.	TRUSSES.		
							No.	Height, ft. in.	No. of panels.
35.	Greenfield road.....	Highway	Whipple's iron truss.	Iron.....	1844	72.0	2	8.0	7
36.	De Peyster street, Rome.....	Highway	Whipple's wooden truss.	Wood.....	.....	82.3	2	8.2	6
37.	James street, Rome.....	Highway	Whipple's cast iron arch.	Iron.....	1857	62.3	3	10.2	9
38.	Washington street, Rome.....	Highway	Whipple's cast iron arch.	Iron.....	1870	78.3	3	9.10	9
39.	George street, Rome.....	Highway	Whipple's cast iron arch.	Iron.....	1870	72.0	2	8.2	9
40.	Jay street, Rome.....	Highway	Shums tubular.....	Iron.....	1853	71.0	2	7.7	6
41.	....., Rome.....	Private.	.....	.....	.....	.....	.....	.....	.....
42.	Dextator avenue, Rome.....	Highway	Whipple's wooden truss, iron chords.	Wood.....	1876	111.2	2	7.0	8
43.	Burns.....	Farm.	Whipple's wooden truss.	Wood.....	1879	71.0	2	7.1 1/2	8
44.	Bradford's.....	Farm.	Whipple's wooden truss.	Wood.....	.....	70.5	2	7.1 1/2	6
45.	Armstrong's.....	Farm.	Whipple's wooden truss.	Wood.....	.....	71.8	2	7.1 1/2	6
46.	Henrich's road.....	Highway	Whipple's wooden truss.	Wood.....	1873	72.0	2	7.1 1/2	6
47.	Seely's road.....	Farm.	Whipple's wooden truss.	Wood.....	.....	72.0	2	7.1 1/2	6
48.	Tuttle's road.....	Highway	Whipple's wooden truss, iron chords.	Wood.....	.....	71.5	2	6.10	6
49.	Main street, New London.....	Highway	Whipple's cast iron arch.	Iron.....	1855	89.2	2	10.6	9
50.	.....	Private.	.....	.....	.....	.....	.....	.....	.....
51.	Grove Spring road.....	Highway	Whipple's wooden truss.	Wood.....	1872	83.6	2	7.6	6
52.	.....	Private.	.....	.....	.....	.....	.....	.....	.....
53.	Starcey's Basin road.....	Highway	Whipple's wooden truss.	Wood.....	.....	74.0	2	7.11	6
54.	.....	Private.	.....	.....	.....	.....	.....	.....	.....
55.	Happy Valley road.....	Highway	Whipple's wooden truss.	Wood.....	.....	71.0	2	6.11	6
56.	Over old Onelda Lake canal.....	T. P. Bridge	Howe's wooden swing.	Wood.....	1870	21.0	2	4.6	7
57.	East road, Higginsville.....	Highway	Whipple's wooden truss.	Wood.....	1877	78.0	2	8.1	6
58.	West road, Higginsville.....	Highway	Whipple's iron arch truss, remodeled from Lewis street Birmingham trusses.	Wood.....	1879	72.0	2	9.4	7
59.	Dunbartow road.....	Highway	Whipple's wooden truss.	Wood.....	.....	71.7	2	6.8	6
60.	Durkee road.....	Highway	Whipple's wooden truss.	Wood.....	.....	71.5	2	6.8	6
61.	State Bridge road.....	Highway	Whipple's wooden truss.	Wood.....	.....	71.3	2	6.8 1/2	6
62.	.....	Private.	.....	.....	.....	.....	.....	.....	.....
63.	East road, Durhamville.....	Highway	Whipple's wooden truss.	Wood.....	1879	72.2	2	8.0	6
64.	Main street, Durhamville.....	Highway	Whipple's cast iron arch.	Iron.....	.....	71.0	2	8.2 1/2	6
65.	Bennett's road, Durhamville.....	Highway	Whipple's wooden truss, iron chords.	Wood.....	.....	71.4	2	6.6	6
66.	Shollhammer road.....	Highway	Whipple's wooden truss.	Wood.....	1873	77.4	2	7.10	6
67.	Leoux Basin road.....	Highway	Whipple's wooden truss.	Wood.....	.....	71.10	2	6.8	6
68.	Peterboro street, Canastota.....	Highway	Whipple's cast iron arch.	Iron.....	.....	72.4	2	8.4	7
69.	Main street, Canastota.....	Highway	Whipple's cast iron arch.	Iron.....	.....	71.0	2	8.4	7

70.	Beaver road (called Beebe's)	Highway	Whipple's wooden truss, iron chords	Wood	1879	71.8	22.3	8.0	6
71.	Fulton's road	Farm	Whipple's wooden truss, iron chords	Wood	1879	72.0	22.3	8.0	6
72.	New Batson road	Highway	Whipple's wooden truss	Wood	1878	71.4	22.3	8.0	6
73.	Canaseraga road	Highway	Whipple's cast iron arch	Iron	1878	71.0	22.3	9.0	7
74.	Chittenango road	Highway	Whipple's cast iron arch	Iron	1878	71.4	22.3	11.4	9
75.	Chittenango road	Private	Whipple's cast iron arch	Iron	1878	71.4	22.3	11.2	9
76.	Bolivar road	Private	Whipple's wooden truss	Wood	1878	70.0	22.3	8.0	6
77.	White's road	Highway	Whipple's wooden truss	Wood	1878	71.7	22.3	8.1	6
78.	Pool's Brook road	Highway	Whipple's wooden truss	Wood	1878	71.4	22.3	8.0	6
79.	Kirkville road	Highway	Whipple's wooden truss	Wood	1878	71.0	22.3	8.0	6
80.	Manlius Center road	Highway	Whipple's wooden truss, iron chords	Wood	1876	71.0	22.3	6.2½	6
81.	Stearns' road	Farm	Whipple's wooden truss	Wood	1876	71.0	22.3	8.1	6
82.	Change, Livingston's Creek feeder	Change	Whipple's wooden truss	Wood	1876	73.9	22.3	7.0	6
83.	Burdick's road	Private	Whipple's wooden truss	Wood	1876	70.8	22.3	7.10	6
84.	Thompson's Landing road	Change	Whipple's wooden truss	Wood	1876	71.0	22.3	7.11	6
85.	Thompson's Landing road	Highway	Whipple's cast iron arch	Iron	1875	81.9	22.3	10.3½	7
86.	Beech street, Syracuse	Private	Whipple's cast iron tubular arch	Iron	1875	73.0	22.3	8.3	7
87.	William street, Syracuse	Highway	Whipple's cast iron arch	Iron	1874	79.0	22.3	8.9½	9
88.	Catharine street, Syracuse	Highway	Whipple's cast iron arch	Iron	1874	97.0	22.3	11.5	9
89.	Orange street, Syracuse	Highway	Whipple's cast iron arch	Iron	1874	100.0	22.3	11.3	9
90.	Grape street, Syracuse	Highway	Whipple's cast iron arch	Iron	1874	98.9	22.3	11.3	9
91.	Mulberry street, Syracuse	Highway	Whipple's cast iron arch	Iron	1872	94.5	22.3	13.0	9
92.	Over Oswego canal	Highway	Whipple's cast iron arch	Iron	1872	94.5	22.3	13.0	9
93.	On Oswego canal	Highway	Soule's wrought iron arch	Iron	1873	70.0	22.3	8.2	6
94.	Warren street, Syracuse	Foot	Iron girder	Iron	1873	62.10	22.3	2.7	6
95.	Salina street, Syracuse	Swing	Iron truss	Iron	1875	90.0	22.3	6.9	10
96.	Salina street, Syracuse	Highway	Whipple's cast iron arch	Iron	1875	71.0	22.3	8.6	7
97.	Clinton street, Syracuse	Foot	Whipple's cast iron arch	Iron	1874	78.5	22.3	6.0½	8
98.	Franklin street, Syracuse	Foot	Whipple's cast iron arch	Iron	1874	75.0	22.3	9.2	7
99.	West street, Syracuse	Highway	Whipple's cast iron arch	Iron	1869	72.2	22.3	9.0	7
100.	Geddes street, Syracuse	Highway	Whipple's cast iron arch	Iron	1870	76.4	22.3	8.4	9
101.	Geddes street, Syracuse	Highway	Whipple's cast iron arch	Iron	1870	86.4	22.3	11.0	9
102.	Bridge street, Geddes	Foot	Whipple's cast iron arch	Iron	1870	89.5	22.3	8.0	9
103.	Salt bridge, Geddes	Foot	Whipple's cast iron arch	Iron	1870	89.5	22.3	8.0	9
104.	Rolling mill	Highway	Whipple's cast iron arch	Iron	1870	71.8	22.3	9.0	7
105.	Gere's landing	Farm	Whipple's wooden truss, iron chords	Wood	1870	71.2	22.3	7.9	6
106.	Gere's	Highway	Whipple's wooden truss	Wood	1870	72.4	22.3	7.6	6
107.	Belle Isle	Highway	Whipple's wooden truss	Wood	1871	70.8	22.3	7.10	6
108.	Amboy	Highway	Whipple's wooden truss	Wood	1872	71.2	22.3	7.11	6
109.	Camillus landing	Highway	Whipple's wooden truss	Wood	1872	71.9	22.3	7.10	6
110.	Newport	Highway	Whipple's wooden truss	Wood	1872	72.2	22.3	7.10	6
111.	Memphis	Highway	Whipple's wooden truss	Wood	1872	71.8	22.3	7.6	6
112.	Peru	Highway	Whipple's wooden truss, iron chords	Wood	1872	72.5	22.3	7.6	6
113.	Shanty point	Private	Whipple's wooden truss, iron chords	Wood	1872	71.10	22.3	7.10	6
114.	California road	Private	Whipple's wooden truss	Wood	1872	72.4	22.3	8.6	6
115.	Beaver street, Jordan	Highway	Whipple's wooden truss	Wood	1873	72.4	22.3	8.6	6

TABLE of State Bridges — (Continued.)

No.	NAME.	Class.	PLAN.	Material.	Date of erection.	Clear span. ft. in.	TRUSSES.		
							No.	Height. ft. in.	No. of panels.
120.	Main street, Jordan.....	Highway.	Whipple's cast iron arch	Iron.....	.....	82.1	2	9.7	9
121.	Hamilton street, Jordan.....	Highway.	Whipple's wooden truss, iron chords	Wood.....	.....	71.9	2	7.6	6
122.	Cold Spring.....	Highway.	Whipple's wooden truss.....	Wood.....	1873	73.6	2	7.10	6
123.	Fountainville.....	Highway.	Whipple's wooden truss.....	Wood.....	.....	72.9	2	6.10	6
124.	Field's.....	Highway.	Whipple's wooden truss.....	Wood.....	.....	72.5	2	7.11	6
125.	Putnam's.....	Private.	.....	.....	.....	.....	.....	.....	.....
126.	Putnam's.....	Farm.....	Whipple's wooden truss, iron chords	Wood.....	1877	72.7	2	7.3	6
127.	.....	Farm.....	Whipple's wooden truss, iron chords	Wood.....	1877	72.0	2	7.8	6
128.	Seneca street, Weedsport.....	Private.	.....	.....	.....	72.3	2	8.1	7
129.	Brutus street, Weedsport.....	Private.	Whipple's cast iron arch	Iron.....	.....	76.6	2	8.1	9
130.	Hamilton's.....	Highway.	Whipple's wooden truss	Wood.....	.....	72.0	2	7.6	6
131.	Centerport.....	Farm.....	Whipple's cast iron arch	Iron.....	.....	72.4	2	8.2	9
132.	Utica street, Port Byron.....	Highway.	Whipple's cast iron arch	Iron.....	1877	90.8	2	11.10	9
133.	Main street, Port Byron.....	Highway.	Whipple's cast iron arch	Iron.....	.....	71.10	2	8.4	9
134.	Owasco street, Port Byron.....	Highway.	Whipple's cast iron arch	Iron.....	.....	75.0	2	8.3	9
135.	Canal street, Port Byron.....	Highway.	Whipple's cast iron arch	Iron.....	.....	71.10	2	8.3	7
136.	Houghtaling's.....	Highway.	Whipple's cast iron arch	Iron.....	.....	72.0	2	8.2	7
137.	McLeod's.....	Highway.	Whipple's cast iron arch	Iron.....	.....	71.7	2	8.3	7
138.	Buckland's.....	Farm.....	Plank truss.....	Wood.....	.....	71.10	2	6.10	4
139.	Salt creek, Montezuma.....	Foot.....	Whipple's cast iron arch	Iron.....	.....	72.0	2	9.2	7
140.	High street, Montezuma.....	Foot.....	Whipple's cast iron arch	Iron.....	.....	72.10	2	6.0	8
141.	Over Cayuga and Seneca canal.....	Highway.	Whipple's wooden truss.....	Wood.....	1873	72.0	2	8.1	6
142.	Clark street, Montezuma.....	Highway.	Whipple's wooden truss.....	Wood.....	.....	72.0	2	7.7	6
143.	May's point (change).....	Highway.	.....	.....	.....	.....	.....	.....	.....
144.	.....	.....	.....	.....	.....	.....	.....	.....	.....
145.	.....	.....	.....	.....	.....	.....	.....	.....	.....

## OVER ORISKANY FEEDER.

1.	Christman's.....	Highway.	Wooden truss	Wood.....	.....	19.2	2	4.2	2
2.	.....	Farm.....	Wooden truss	Wood.....	.....	19.5	2	4.3	2

## OVER ORVILLE FEEDER.

1.. Change .....	Highway	Wooden truss.....	Wood....	1873	48.0	2	5.5
2.. Orville.....	Highway	Whipple's cast iron arch.....	Iron.....	1870	45.6	2	6.3

## OVER CAMILLUS FEEDER.

1.. Main street, Camillus.....	Highway	Whipple's wooden truss.....	Wood....	.....	34.6	2	5.10
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## ONEIDA LAKE CANAL.

1.. Towing path, junction with Erie.....	Swing	Howe's wooden truss.....	Wood....	.....	30.0	3	4.5
2.. Robbins'.....	Perm.	Whipple's wooden truss.....	Wood....	.....	70.10	2	7.9
3.. Betinger's.....	Highway	Whipple's wooden truss.....	Wood....	.....	73.0	2	8.2
4.. Kelly's.....	Highway	Whipple's wooden truss.....	Wood....	.....	72.0	2	8.0
5.. Woodhouse.....	Highway	Whipple's wooden truss.....	Wood....	.....	72.0	2	8.3
6.. Yaws.....	Highway	Whipple's wooden truss.....	Wood....	.....	71.0	2	7.11
7.. Tubbs.....	Highway	Whipple's wooden truss.....	Wood....	.....	71.0	2	7.11
8.. South Bay.....	Highway	Whipple's wooden truss.....	Wood....	.....	73.8	2	8.0

*Oswego Canal.*

This canal connects the Erie canal at Syracuse with Lake Ontario at Oswego. Is thirty-eight miles long.

Lockage on main line 148.71 feet, as follows:

Lock.		Feet lift.
No. 1,	Salina, downward going north,	11.00
No. 2,	Salina, downward going north,	11.00
No. 3,	downward going north,	10.50
No. 4,	(side-cut Salina 8.13 lift)	
No. 5,	downward going north,	1.55
No. 6,	downward going north,	7.00
No. 7,	downward going north,	5.87
No. 8,	downward going north,	11.25
No. 9,	downward going north,	7.25
No. 10,	downward going north,	9.00
No. 11,	downward going north,	11.70
No. 12,	downward going north,	11.25
No. 13,	downward going north,	5.60
No. 14,	downward going north,	9.50
No. 15,	downward going north,	5.75
No. 16,	downward going north,	8.66
No. 17,	downward going north,	10.50
No. 18,	Oswego, downward going north,	11.33

One weigh-lock, at Oswego.

Five guard-locks on the main line.

*Dams.*

No. 1....	Phoenix.....	Stone.....	Spillway.....	440 feet.
No. 2....	Oswego Falls..	Stone .....	Spillway.....	413 feet.
No. 3....	Fulton .....	Stone.....	Spillway.....	503 feet.
No. 4....	Van Buren...	Stone .....	Spillway.....	662 feet.
No. 5....	Minetto.....	Stone.....	Spillway.....	445 feet.
No. 6....	High dam....	Stone... ..	Spillway.....	363 feet.
No. 7....	Oswego .....	Stone.....	Spillway.....	530 feet.

*Feeders.*

Erie canal, Syracuse..	Cubic feet per minute (estimated)...	10,000
Seneca river ... ..	Cubic feet per minute (estimated)...	54,000
Oneida river .....	Cubic feet per minute (estimated)...	20,000

*Culverts.*

One stone culvert.

Nine composite culverts.

*Waste-weirs.*

Thirteen wooden waste-weirs.

*Bridges.*

Three change bridges, Syracuse.

James street, Syracuse, Whipple's iron arch truss, double track.

William street, Syracuse, Whipple's iron arch truss, double track.

Salina street, Syracuse, Whipple's iron arch truss, double track.

Division street, Syracuse, Whipple's iron arch truss, single track.

Bear street, Syracuse, Whipple's iron arch truss, single track.

Lodi street, Syracuse, Whipple's iron arch truss, single track.

Salina street, Salina, Whipple's iron arch truss, single track.

Park street, Salina, Whipple's iron arch truss, single track.

Park street (side-cut), Salina, Whipple's iron arch truss, single track.

Change, near outlet.

Cold Spring, Whipple's iron arch truss, single track.

Belgium, Whipple's iron arch truss, single track.

Lock street, Phoenix, Whipple's iron arch truss, single track.

Bridge street, Phoenix, Whipple's iron arch truss, single track.

Broadway, Fulton, Whipple's iron arch truss, single track.

First street, Fulton, Whipple's iron arch truss, single track.

Amidon street, Fulton, Whipple's iron arch truss, single track.

Terry's Basin, Fulton, Whipple's iron arch truss, single track.

Minetto, Minetto, Whipple's iron arch truss, single track,

Utica street, Oswego, deck bridge, iron, single track.

Seven change bridges, wooden, single track.

Change and road, Green Point, wooden, double track.

Sycamore street, Liverpool, wooden, single track.

Over ditch, wooden, single track.

Towing-path and road, single track.

Bridge over Oneida river, wooden, single track.

Road bridge, below, single track.

Hinmansville, Whipple's wooden truss, single track.

Tannery, Oswego, Whipple's wooden truss, iron chords, single track.

Upper landing, Fulton, Whipple's wooden truss, single track.

*Seneca River Improvement and Baldwinsville Side-cut.*

One wooden lift lock at Baldwinsville.

One stone guard-lock at Baldwinsville.

One wooden dam at Baldwinsville.

One wrought iron arch bridge at Baldwinsville, double track.

Two wooden bridges at Baldwinsville, single track.

One Whipple's iron arch truss bridge at Jack's reef, single track.

*Oneida River Improvement.*

One crib and stone dam at Caughdenoy.

One tree dam at Oak Orchard.

One steamboat lock (120 by 30 feet) at Oak Orchard.

One steamboat lock (120 by 30 feet) at Caughdenoy.

One wooden swing bridge at Brewerton.

One wooden draw bridge at Caughdenoy.

One wooden draw bridge at Oak Orchard.



*Cayuga and Seneca Canal*

Connects the Erie canal at Montezuma with Seneca lake, at Geneva, is 20.27 miles in length, and with branch from lock No. 9 to Cayuga lake, 2.50 miles in length.

Total lockage 86.58 feet, as follows :

Lock No. 1, Waterloo, downward going east.....	7.28 feet lift.
Lock No. 2, downward going east.....	7.00 " "
Lock No. 3, downward going east.....	10.00 " "
Lock No. 4, downward going east.....	9.00 " "
Lock No. 5, downward going east....	9.00 " "
Lock No. 6, downward going east.....	9.60 " "
Lock No. 7, downward going east.....	6.00 " "
Lock No. 8, Seneca river, downward going east.....	5.70 " "
Lock No. 9, upward going east.....	10.00 " "
Lock No. 11, Montezuma, upward going east.....	3.00 " "

*Cayuga Branch.*

Lock No. 10, Cayuga lake, upward going east.....	10.00 " "
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*Location of Feeders.*

Seneca lake, at Geneva .....	18,000 cubic feet per minute.
Erie canal, at Montezuma.....	4,000 cubic feet per minute.

Four piers in Geneva Harbor.

One pier at Cayuga.

Two piers and light-house at Ithaca.

*Bridges.*

Lake street, Geneva, Whipple's iron arch truss, double track.

Evans street, Geneva, Whipple's iron arch truss, single track.

County line, Whipple's wooden truss, single track.

Teals, Whipple's iron arch truss, single track.

Outlet, Whipple's iron arch truss, single track.

Locust street, Waterloo, Whipple's iron arch truss, single track.

Virginia street, Waterloo, Whipple's iron arch truss, double track.

Short level, Whipple's iron arch truss, single track.

Towing-path, Whipple's wooden truss.

Gorham's, Whipple's wooden truss, single track.

Towing-path, Whipple's wooden truss.

Kingdom, Whipple's wooden truss, single track.

Bridge street, Seneca Falls, Whipple's iron arch truss, double track.

Ovid street, Seneca Falls, Whipple's iron arch truss, double track.

Change and road, Seneca Falls, Whipple's wooden truss, single track.

Towing-path, below Seneca Falls, Whipple's wooden truss.

De Monts', Whipple's wooden truss, single track.

Towing-path, over Seneca river, Whipple's wooden truss.

Change bridge, Cayuga and Seneca Junction, Whipple's wooden truss.

Free bridge, north of Junction, Whipple's iron arch truss, single track.

Stahlnecker's farm, Whipple's wooden truss, single track.

Stiles road, Whipple's wooden truss, single track.

Swing bridge over lock No. 10.

Black River canal connects the Erie at Rome with the Black river below Lyon's Falls, and is 35.33 miles in length.

The waters from the Black River feeder are taken into this canal at Boonville and feed northerly (about nine miles) to Black river, and southerly (twenty-four and one-third miles) to Rome, when they are discharged through the feeder into the Erie canal.

The Black River improvement extends from the foot of lock 109, just below Lyon's Falls, to the State dam at Carthage, a distance of 42.50 miles.

#### *Structures on Black River canal.*

- 109 stone lift-locks, on main canal.
- 1 stone guard-lock, on Forest Port feeder.
- 1 stone guard-lock, on Delta feeder.
- 6 aqueducts.
- 19 culverts.
- 11 waste-weirs.

#### *River and Feeder Dams.*

- Delta feeder dam, across the Mohawk river.
- Lansing Kill feeder dam, between locks 33 and 34.
- Upper Lansing Kill feeder dam, between locks 62 and 63.
- Forest Port dam, across Black river.
- Lyon's Falls dam, across Black river.

#### *Bridges.*

- 39 wooden farm bridges.
  - 29 wooden road bridges.
  - 6 iron road bridges.
  - 12 wooden towing-path bridges.
  - 1 wooden bridge at Lyon's Falls, over Black and Moose rivers, four spans.
- Black River improvement has six bridges, located as follows :
- One  $2\frac{1}{4}$  miles below Lyon's Falls (Whittlesey), two spans and a swing.
  - One near Glensdale (Tiffany), two spans and a swing.
  - One 3 miles above Lowville (Beach's), two spans and a swing.
  - One 3 miles below Lowville (Illingworth), three spans and a swing.
  - One near Castorland (Parker's), three spans and a swing.
  - And the Carthage bridge (455 feet in length) seven spans.
  - One steamboat lock and dam, located  $1\frac{1}{4}$  miles below Glensdale.
  - One steamboat lock and dam, located  $1\frac{1}{4}$  miles above Beach's bridge.

## ENGINEERING DEPARTMENT.

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### MIDDLE DIVISION.

During the fiscal year this division of the canals was under the charge of Marvin Porter, division engineer, and Denison Richmond, resident engineer.

Table No. 1, annexed, shows in detail the cost of engineering during the year, the names of all persons employed, and the compensation of each.

No work has been done under special contract on this division during the year, but all improvements and repairs have been made by the assistant and section superintendents, under the advice and direction of the engineering department.

The engineering expenses, on this division, have been greater than in 1878, on account of bridge surveys on the Erie canal, and the making of surveys and maps of claims against the State for lands appropriated and damages claimed to have been done by the State on Chenango extension.

TABLE No. 1.

*Statement of engineering, together with incidental expenses, upon ordinary repairs of the Middle Division, New York State canals, for the fiscal year ending September 30th, 1879, and paid by the Division Engineer, under act chapter 385, Laws of 1876.*

## ERIE CANAL

NAMES.	Rank.	No. of days.	Rate of compensation.	Amount.	Total.
Marvin Porter.....	Division Engineer.....	Salary	\$2,400 00	\$1,275 00	
".....	".....	Travel		275 08	
Denison Richmond.....	Resident Engineer.....	Salary	2,000 00	1,500 09	
".....	".....	Travel		339 89	
John S. Kullaly.....	Leveler.....	818	4 50	1,408 50	
".....	".....	Travel		5 01	
Francis K. Baxter.....	Rodman.....	818	8 50	1,095 50	
".....	".....	Travel		101 98	
J. R. Baxter.....	Chainman.....	11	2 50	27 50	
".....	Use of instruments, etc.....			8 00	
Henry T. Beach.....	Assistant Engineer in charge.....	119	\$6 less \$5 per week for board	615 43	
Frank W. Smith.....	Chainman.....	108	2 50 "	189 29	
George Dinehart.....	Chainman.....	24		60 00	
Frank Randall.....	Axeman.....			10 83	\$6,796 25
<i>Incidental Expenses.</i>					
Stationery.....				\$145 27	
Postage and telegraph.....				60 91	
Fuel and light.....				56 44	
Labor.....				4 75	
Miscellaneous.....				696 07	963 44
Total for Erie canal.....					\$7,759 69

TABLE 1 — Continued.

## OSWEGO CANAL.

NAME.	Rank.	Number of days.	Rate of compensation.	Amount.	Total.
Marvin Porter.....	Division engineer.....	Salary...	\$2,400 00	\$195 00	
Marvin Porter.....	Division engineer.....	Travel.....	.....	54 40	
Denison Richmond.....	Resident engineer.....	Salary...	2,000 00	125 00	
Denison Richmond.....	Resident engineer.....	Travel.....	.....	7 10	
Total for Oswego canal.....	.....	.....	.....		\$381 50

## CAYUGA AND SENECA CANAL.

Marvin Porter.....	Division engineer.....	Salary...	\$2,400 00	\$130 00	
Marvin Porter.....	Division engineer.....	Travel.....	.....	26 16	
Total for Cayuga and Seneca canal,	.....	.....	.....		156 16

## BLACK RIVER CANAL.

Marvin Porter.....	Division engineer.....	Salary...	\$2,400 00	\$250 00	
Marvin Porter.....	Division engineer.....	Travel.....	.....	106 80	
Denison Richmond.....	Resident engineer.....	Salary...	3,000 00	350 00	
Denison Richmond.....	Resident engineer.....	Travel.....	.....	60 32	
Total for Black River canal.....	.....	.....	.....		767 12

## CHENANGO CANAL.

Marvin Porter.....	Division engineer.....	Salary.....	\$2,400 00	\$125 00
Marvin Porter.....	Division engineer.....	Travel.....	.....	24 28
Total for Chenango canal.....	.....	.....	.....	\$149 28

## ONEIDA LAKE CANAL.

Marvin Porter.....	Division engineer.....	Salary.....	\$2,400 00	\$50 00
Marvin Porter.....	Division engineer.....	Travel.....	.....	7 34
Denison Richmond.....	Resident engineer.....	Salary.....	2,000 00	25 00
Denison Richmond.....	Resident engineer.....	Travel.....	.....	1 00
Total for Oneida Lake canal.....	.....	.....	.....	83 34

## EXTENSION OF THE CHENANGO CANAL.

Marvin Porter.....	Division engineer.....	Salary.....	\$2,400 00	\$375 00
Marvin Porter.....	Division engineer.....	Travel.....	.....	145 64
Henry T. Beach.....	Assistant " in charge.....	80	6 00	480 00
Henry T. Beach.....	Assistant " in charge.....	Travel.....	.....	195 80
William F. Lentz.....	Rodman.....	41	3 00	123 00
William F. Lentz.....	Rodman.....	Travel.....	.....	12 72
Patrick Burke.....	Axeman.....	11	2 00	22 00
Daniel W. Whitcomb.....	Chairman.....	10½	2 00	21 00
Nathaniel Howie.....	Chairman.....	10½	2 00	21 00
Total for extension of Chenango canal.....	.....	.....	.....	1,396 16

*Summary.*

Erie canal.....	\$7,759 69
Oswego canal.....	381 50
Cayuga and Seneca canal .....	156 16
Black River canal.....	767 12
Chenango canal.....	149 28
Oneida Lake canal.....	83 34
Extension of Chenango canal.....	1,396 16
<b>Total for ordinary repairs.....</b>	<b>\$10,693 25</b>

## CONDITION OF THE CANALS.

## GENERAL REMARKS.

During the season of 1878, all the structures on this division, were carefully examined, their defects noted, and bills of timber furnished the assistant superintendent, to enable him to procure the necessary material during the season of navigation in 1878 for making repairs in the spring of 1879.

Nearly all the materials were obtained and delivered before the close of navigation last fall and ready for the repairs needed, and as soon as the weather would permit the water was drawn out of the canal and a more thorough survey and inspection of the structures to be repaired made, than it was possible to make while the water was in the canal.

The work of repairs was determined on and commenced together with the bottoming out of the canal (where it was left originally too high), and the removing of the bars, formed at the mouth of the feeders, and the sedimentary deposits along the canal, and the cleaning out of feeder channels, to facilitate the discharge of water through them; so thoroughly was this work of bottoming out done that the proper depth of water has been maintained on all the levels this season.

The engineering department furnishes the assistant Superintendent all necessary data and plans for all work required to be done in making repairs to structures, and in cleaning out the canals and feeders, giving their personal attention to all repairs, and furnishing bills of iron and timber promptly, that there should be no delay.

The following improvements and repairs, heretofore recommended, have been made during the last fiscal year:

SUMMARY OF STRUCTURES REBUILT OR REPAIRED DURING THE  
FISCAL YEAR.*Erie Canal.*

Nine aqueducts repaired.  
Eight bulk-heads rebuilt.  
Eight bridges rebuilt.  
Eight iron bridges rewooded.  
One hundred and twenty-nine bridges repaired.  
Two bridges built on Orville feeder.  
Eight lock-gates, new.  
Forty-four lock-gates repaired.  
Two culverts repaired.  
Nine feeder channels cleaned out.  
Dam, overfall, bulk-head and new channel constructed for Orville feeder.

*Oswego Canal.*

Three lock-gates new.  
Sixteen lock-gates repaired.  
Three bridges rewooded.  
Thirty-six bridges repaired.  
Three hundred and eight feet of Fulton dam apron built.  
Sustaining wall above lock 17 repaired.  
Three spillways repaired.  
One bridge at Jack's reef repaired.

*Cayuga and Seneca Canal.*

One lock relined and thoroughly repaired.  
Ten lock-gates repaired.  
One bridge rebuilt.  
Twenty-four bridges repaired.

*Black river Canal.*

One hundred and nine locks more or less repaired.  
Six aqueducts more or less repaired.  
Eighty-six bridges more or less repaired.

*Black river Improvement.*

Carthage Bridge, seven spans repaired throughout.  
Swing of the Whittlesey Bridge rebuilt of wood, and the north span rebuilt of iron.  
One steamboat lock partially repaired.

*Chenango Canal.*

Twenty-four bridges on this canal have been taken down, the approaches lowered and short bridges or culverts substituted.



## GENERAL DESCRIPTION OF WORK DONE.

*Erie canal.*

- Oriskany creek aqueduct, trunk repaired in April, 1879.  
 Chittenango creek aqueduct, trunk repaired in April, 1879.  
 Limestone creek aqueduct, trunk repaired in April, 1879.  
 Butternut creek aqueduct, trunk repaired in April, 1879.  
 Jordan aqueduct, trunk repaired in April, 1879.  
 Centreport aqueduct, trunk repaired in April, 1879.  
 Owasco creek aqueduct, trunk repaired in April, 1879.  
 Crane brook aqueduct, trunk repaired in April, 1879.  
 Seneca river aqueduct, trunk repaired in April, 1879.  
 Bulkhead at Carpenter brook, rebuilt in April, 1879.  
 Bulkhead at Putnam brook, rebuilt in April, 1879.  
 Bulkhead of Port Byron feeder, rebuilt in April, 1879.  
 Bulkhead and waste-weir at big basin, East Utica, rebuilt in April, 1879.  
 Waste-weir Port Byron feeder, rebuilt in April, 1879.  
 Bulkhead in Hayden's race, rebuilt.  
 Bulkhead at Fayetteville, rebuilt in April, 1879.  
 Clay street wooden bridge (Utica), taken down and the iron bridge from Garden street (Chenango canal) substituted.  
 Broad street bridge (Utica), rewooded.  
 Seneca street bridge (Utica), rewooded and iron needle beams inserted.  
 Washington street bridge (Utica), rewooded and iron needle beams inserted.  
 Broadway foot bridge (Utica), repaired.  
 Bridge No. 43, wooden Whipple truss, rebuilt.  
 Bridge No. 58, wooden Whipple truss, was taken down and an iron Whipple truss, from the Chenango canal, lengthened and erected in its place..  
 Bridge No. 63, Durhamville, Whipple's wooden truss broke down, in August, 1878, and was rebuilt on same plan January, 1879.  
 Bridge No. 70, Whipple's wooden truss, iron chords, rebuilt on same plan as the old one.  
 Bridge No. 71, known as the Herrick's farm bridge, wooden truss, iron chords, rebuilt on same plan as the old one.  
 Change bridge at Limestone creek feeder, was removed and the old pipe truss bridge, formerly on Franklin street, Syracuse, repaired and put up in its place, in April, 1879.  
 Change bridge at Montezuma, repaired by inserting new chords.  
 Swing bridge over old Oneida Lake canal, rebuilt on same plan as the old bridge.  
 Docking at New London, repaired.  
 State dam at Cazenovia, walls taken down and relaid.  
 The gates on locks Nos. 46, 47, 48, 49, 50, 51 and 52, have all been repaired and are in good working order.  
 Feeders cleaned out and enlarged, in April, 1879: Oriskany,

Chittenango, Carpenter brook, Oneida, Butternut, Port Byron, Cowassalon, and Canillus.

All necessary repairs made on Syracuse bridges.

*Oswego canal.*

Towing-path bridge (Syracuse), rebuilt in 1879.

River wall above lock No. 17, repaired in 1879.

Apron of Fulton dam, completed in 1879 (308 lineal feet built this year).

Iron chord bridge at Hinmansville, repaired in 1879.

*Black river canal and river improvement.*

Black river feeder, Forest Port to Boonville, cleaned out in April last and towing-path faced with gravel on inside where needed, and wherever the embankments of this feeder have shown a tendency to slide, piles have been driven at the foot of the outer slope and the banks strengthened where necessary.

Carthage bridge, thoroughly repaired and strenghtened, by the insertion of additional chords and crotch rods, and the whole structure rewooded.

Draw of Whittlesey bridge, rebuilt and masonry of draw abutment repaired.

North span of Whittlesey bridge, replaced by Whipple iron arch truss, taken from Clinton, Chenango canal.

Road and farm bridges repaired.

*Cayuga and Seneca canal.*

Lock No. 1, repaired and relined.

Change bridge at Mud lock, rebuilt.

Channel dredged out at the mouth of Castle creek, Geneva.

Slight repairs have been made on locks and bridges on this canal during the year.

There has been a change in the towing path at Geneva, to accommodate the "Syracuse, Geneva and Corning Railroad Company" in transferring coals from cars to canal boats, by constructing an elevated track, with pockets and chutes, for that purpose. This involved the necessity of constructing two swing bridges at either end of the elevated track, and a towing-path on the berme, between these bridges; this does not essentially affect the navigation of the canal, but may benefit the business in the shipment of coals from this point.

The work of building these bridges and changing the towing-path was done by the said railroad company, and the cost defrayed by it.

*Chenango canal.*

Lebanon feeder channel cleaned out and enlarged in 1879; dam rebuilt and bridges on this feeder repaired in 1879.

Dam of Madison reservoir, faced with stone in 1879, which work has been done in a substantial and workmanlike manner.

*Condition of the Chenango Canal Bridges.*

The following canal bridges have been taken down and the approaches graded to the level of the towing-path, and shorter bridges substituted, north of lock No. 77 (which is located at the south end of the Summit level), and culverts sufficient for drainage, south of said lock, constructed, and the roadways filled to a proper grade, viz.:

- The Garden street, Utica, iron bridge.
- The turnpike bridge near New Hartford.
- The iron bridge at Clinton.
- One wooden bridge at Clinton.
- The first wooden bridge north of Clinton.
- Two iron bridges in the village of Hamilton.
- The first bridge south of Earlville.
- One bridge at Earlville.
- The first and third bridges north of Sherburne.
- The swing bridge at Sherburne.
- The bridge at Wood's Corners.
- The two iron bridges at Oxford.
- The Stratton bridge.
- The Brisbin bridge.
- The Cook bridge.
- The two bridges near Tillotson's mill.
- The Town bridge.
- One swing bridge at Greene.
- One wooden bridge at Greene.
- One iron bridge at Greene.
- Chenango Forks bridge.
- Port Crane bridge.
- Van Name's bridge.
- Carman's bridge.
- Port Dickinson bridge.
- State bridge.
- Asylum bridge.

The remaining bridges should be removed, and the approaches lowered to the level of the towing-path, at an early day, as most of them are unsafe and liable to go down under an ordinary load, and the State be called upon to pay damages.

*General Remarks.*

Though the canals and structures on this division, now in operation, are in a better condition than for several years past, there yet remains considerable work to be done, that was recommended in my report of 1878, to wit:

The coping stone of the aqueducts on the Erie canal should be relaid, where out of repair, to protect the masonry from the injury incident to the rains and frost.

The Fayetteville feeder dam is much out of repair and should be rebuilt with as little delay as possible.

The walls of locks Nos. 34, 35, 36, 37, 38 and 39 on Black River canal should be repaired, to put them in a workable condition for next season; also locks Nos. 75, 80, 81, 84, 87, 88, 89, 90, 99, 100 and 101.

The towing-path bridge of Mohawk aqueduct, should be rebuilt. Estimated cost \$500.

The long span of Willis creek aqueduct and the towing-path bridge of said aqueduct, should be rebuilt the coming spring. Estimated cost \$2,500, and the towing-path bridge of Lansing kill aqueduct, should be rebuilt. Estimated cost \$500.

The further enlargement of Oriskany creek feeder, the bottoming out the Madison brook feeder and the balance of the long feeder from Eaton brook to the summit; estimated cost of this work \$2,500.

In addition to the above I would recommend that the following repairs be done the coming spring, to wit:

The De Peyster street bridge, Rome, should be rebuilt this winter; the present structure is a wooden Whipple truss, much decayed. I would recommend an iron bridge for this place, it being more economical for the State than wood.

If the present spillway west of Amos' mill is to be maintained the trunk leading from it to the culvert over Onondaga creek should be rebuilt this winter; this trunk passes for its entire length under the mill, discharging the waste water into the creek; this work will cost \$2,000.

The interest of the State would be to close up this spillway and to construct one on the towing-path side and discharge the waste water into the creek within the limits of the State lands. This, and this alone, would give the State control of the Syracuse level.

The apron of Oriskany dam should be repaired to protect it from further damage during the spring floods.

The Oneida creek feeder should be bottomed out between the village of Oneida and the Erie canal, before the opening of navigation in 1880.

The circular track of Salina street bridge, in Syracuse, is of iron and badly worn, it should be replaced by a steel rail which would be more durable, and more easily operated.

The parapet and wing walls of Canaseraga culvert should be taken down, and relaid to make the structure and the banks supported by these walls secure against accident.

### *Montezuma Level.*

I would recommend the raising of the Montezuma level at least six inches; this would give the proper depth of water in the Seneca river aqueduct which now has a depth of six and a half feet only, and at the same time, lessen the lift of locks Nos. 52 and 53. Estimated cost \$12,500.

Lock No. 52 having a greater lift toward tide water, than any other on the Erie, it regulates the time for all boats moving eastward and limits the number that can be passed over the whole line, in a given time.

When a boat is towed into a lock, it has to displace a volume of water, equal to that part of the boat submerged, and on entering the jaws of the lock, act as a piston in a pump, forcing the water out of the chamber, which has to pass along the sides and under the bottom of the boat, and as the boat has a sectional area, five times greater than the area of the spaces on the two sides, added to the space under the boat, it will be readily seen that the boats are made too wide for the locks, and when a loaded boat is to be lifted from one level to another, this disproportion is made apparent, but in locking down, this disproportion is less objectionable; it is also plain that the regulated size of boats is too great, for the width of the lock chamber.

The chamber, of the lock in question, is eighteen feet at the surface of the water on the lower level, and the width of the largest boats seventeen feet six inches, and the only way, to facilitate lockages through 52, will be to introduce some stationary power and use it until the chambers of this lock, can be made two feet wider. Lock 47 has a lift of 10.175 feet, and 48 has a lift of 10.538 feet, but are two feet wider in the chamber and are furnished with tumble gates that leak less than the common gate.

- Tumble gates in lock 52 would be an improvement on the present if nothing further should be done, but this alone would not accomplish all that is required to prevent delays at this point during the most busy season; I would therefore recommend the widening of this lock two feet, making it twenty feet wide in the chamber.

Lock No. 3, Cayuga and Seneca canal will require one upper gate, and lock 6 one upper gate and lock 11 one lower gate, before opening the canal for navigation in 1880.

Swing bridge over lock 10 near Cayuga bridge is out of repair and needs attention.

The channel between the swing bridges at Geneva should be cleaned out to the proper depth.

The valves in the pipes of the following reservoirs are out of order, to wit:

The Erieville, the Bradly Brook, the Eaton and the Lebanon, leaving but one valve in each of the above-named reservoirs that can be operated, and, should any accident befall this one, it would be difficult to control the water supply or to repair them when the reservoir is full. I would, therefore, recommend that these repairs be made as soon as possible.

#### *Oswego Canal.*

I would again recommend the completing of the aprons of the Phoenix, Van Buren, and Minetto dams, and the renewing the apron of the Oswego dam. Estimated to cost, respectively, \$3,400, \$5,748,

\$2,975, and \$2,650 ; also, the refilling of the High dam (which leaks badly through the present filling). This dam is located a few feet below an old dam, and the space between them partially filled with stone, and perhaps with gravel, though there is nothing to show that any gravel was used in making this filling. This space should be filled to protect the structure.

All the locks and lock-gates are in good working order except the guard-lock at the head of Battle island. I would recommend new gates for this lock, and that they be put in this fall, to secure the canal below against the spring floods.

I would again call attention to the piers at Ithaca and Cayuga ; the timber in both these piers is too rotten to hold the stone filling in place much longer, and, unless this work is done promptly, all this filling will go to waste (and worse than waste, as it will fill up these harbors and interrupt navigation), and make it necessary to procure new material for filling the cribs in the docking.

To repair the Ithaca pier will cost about \$6,000, and the Cayuga pier \$2,600.

The docking along the front angle of the towing-path at Geneva is in a bad condition and should be repaired.

The towing-path in the city of Utica is low in several places, and on the long level the banks are low in many places and need raising.

The banks in the city of Syracuse, from Franklin street to Geddes street, should be raised six inches.

Towing-path bank on the Montezuma level is low on the back side, and should be raised to make it safe.

The spillway and bulk-head at Durhamville is placed directly over the Oneida creek culvert, which is a stone structure. The foundation of this culvert is being undermined by the waters discharged over this spillway and needs early attention.

The banks of the old Oneida Lake canal are low, from its junction with the Erie canal to the thorough cut north of said junction ; should be raised one foot to prevent a break from overflow.

The guard-bank on the west side of Butternut creek, just below the aqueduct, should be rebuilt, to protect the lands below from damage when the water is drawn from the canal at this aqueduct.

The trunks of the South Lake reservoir are of wood and somewhat decayed. This trunk will have to be renewed the coming year. In renewing this structure, I would recommend the substitution of cast iron pipes, with improved gates, and well-house. (See plan hereto attached.)

The lower ends of the trunks of North Lake reservoir will require some repairing the coming season, and iron pipes should be substituted at the end of two years.

I would recommend the building of an iron foot bridge over the canal, at the east end of the weigh-lock, in Syracuse. This lock is so situated (in relation to the street bridges) that boatmen find great difficulty in getting from the towing-path to the collector's office to transact their business.

The masonry in the piers and abutments of the Black and Moose river bridge is much out of repair, and the timbers in the superstructure of that part of the bridge spanning the Black river are much decayed, and the bridge is unsafe.

The slope-wall at the west end of the Lyon's Falls dam should be taken down and relaid.

The north end of the abutment of the Whittlesey swing bridge has settled about eight inches, and, to secure it and prevent further settlement, a close row of piles should be driven along the face of the abutment and upper wing.

During the reconstruction of the swing, the masonry was repaired and coping raised to its original height. The work proposed is for the purpose of securing it against further displacement. This work can be done best in the winter when the river is frozen over.

The old roadway from Woodhull to Sand lake has been abandoned and one built on a new route; and from Sand lake to North lake the old road has been repaired; and the road from North lake to South lake has been but partially repaired. I would recommend its completion the coming season, so that such materials as will be needed for repairing South lake reservoir can be conveyed over this road.

#### GENERAL CONDITION OF THE PRISM OF THE CANAL.

The time allowed for bottoming out the Erie in April last was too short for the removal of all the deposits of gravel and mud for the full width of the bottom, it was therefore decided to clean the center of the channel to its original depth and as wide as the time allowed for this work would permit, leaving the bottom on the sides of the channel higher than the center, to be taken out the following year or so much of it as the time and means might justify.

If the same amount of work should be done in the spring of 1880 as was done this year (1879), and a similar amount in 1881, the canal would be restored to its original capacity or nearly so, with no other means than the earnings of the canal appropriated for that purpose.

The Frankfort level from the east line of Oneida county to the east end of Big basin, the center of the channel is full depth, but on either side the bottom is high.

From east end of Big basin to Whitesboro' street bridge, bottom high, being filled from the wash of the streets, manure from the stables, ashes from the houses located on either side of the canal; and cast-off shoes, old worn-out tin ware and every thing that people wish to put out of sight.

From Whitesboro' street to lock No. 46, bottom a little high but not so as to interfere with navigation; should be cleaned out next spring.

#### *Long Level.*

From lock No. 46 to railroad bridge at Rome, center of the channel the proper depth, bottom on either side high. Boats occasionally touch bottom in passing when fully loaded.

From railroad bridge to Jay street bridge, bottom generally high, being filled from the wash of the streets, and ashes, manures and old cast-off shoes and worn-out tin ware.

From Jay street bridge to the glass works at Durhamville, the center of the channel is the proper depth, but on either side, where the canal is in thorough cuttings the bottom is high.

From the glass works to the mouth of Oneida Lake canal bottom generally high.

From the mouth of said Oneida Lake canal to Cowasselon aqueduct, the center of the channel full depth, but on either side the bottom (in thorough cuts) is high.

From Cowasselon aqueduct to Canastota, the center is of a proper depth, sides of bottom high.

From Canastota to a point five chains east of New Boston, the center of bottom of channel the proper depth, sides high and need bottoming out.

From the last-named point to a point five chains west of New Boston, bottom high for the whole width of canal.

From the last-named point to Syracuse the center of channel the proper depth and the sides high where the canal is in thorough cuts.

From lock No. 49 to the west line of Geddes, embracing the city of Syracuse the bottom is generally high, having been filled up by the deposits from the Long level and from the ashes and waste material thrown into the canal by the citizens located on the line of the canal (and one of the worst places on this section is opposite the brewery where the waste water from this establishment is discharged into the canal, which when exposed to the sun and air poisons the atmosphere in that part of the city, particularly at the time of removing this deposit in the spring).

From the west line of Geddes to lock No. 50, the center of the canal is deep enough while the sides of the bottom are too high.

From lock No. 50 to Nine Mile Creek aqueduct, the center of channel is deep enough but the sides are too high.

From Nine Mile Creek aqueduct to Jordan (lock No. 51), the center channel is of the proper depth except at Newport where the bottom is generally high, and the sides for most of this distance are high.

From lock No. 51 to lock No. 52, the center of the channel is generally deep enough while the sides are high, in all thorough cuts.

From lock No. 52 to the end of this division, the center channel has a sufficient depth except that part lying between Montezuma village and the Seneca River aqueduct. The sides in all the thorough cuts are high, but rarely so in embankments.

Some measures should be adopted to put an end to the practice (in all the cities and villages on the lines of the canals) of depositing dead cats and dogs, spoiled meats, old baskets, worn-out tin ware, old cast-off clothes and shoes, and other worthless things together with the manures and ashes that accumulate in these cities and villages near these canals, poisoning the waters as well as the air in such neighborhoods.



*Bench Walls that should be removed and Full Slope Wall substituted.*

The original bench walls on this division have never been entirely removed, under contract of Horace Candee, dated October 21, 1874, 448 chains were removed on the berme side of the Jordan level and a full slope wall substituted commencing at Jordan and extending to a point three-fourths of a mile east of Memphis, when this contract was canceled. There still remain about 450 chains between this point and lock 50, all on the berme side.

The contracted channel caused by these benches has been the source of constant annoyance to boatmen, especially when attempting to pass each other.

The superintendent has endeavored to remedy the difficulty by dredging out the bench, but this affords but temporary relief as the wall above is deprived of its support, and serious slides are certain to follow after the water is drawn off.

The point next in importance is between lock 47 and Butternut Creek aqueduct, on the berme side, about 250 chains in length. The bank above the bench is high and springy, and sloughs off into the prism each spring carrying the wall with it. A full slope wall should be substituted.

**BREAKS OCCURRING ON THIS DIVISION DURING THE YEAR.**

On the night of the tenth of December, a slide commenced on the outside of the towing-path, between Geddes street bridge and Central and Hudson River railroad bridge, breaking into the towing-path about twelve feet. To prevent a serious break, the water was drawn two and one-half feet and kept at that stage until April, when repairs were made by first driving a row of piles along the foot of the outer slope for a distance of 450 feet, and loading the bank just above the piles with cobble stone sufficient to make it secure and permanent.

In the month of July, a break occurred on the Oneida Lake canal, between the junction with the Erie and the first lock on the Oneida. Although the break was repaired the canal remained closed, lest a similar break should occur attended with greater damages to the lands and property along its line.

This canal can never be used as such until it is reconstructed in part, as recommended in this report.

A break occurred on the Erie canal, at the State street pipe culvert, in Utica, on the fifth day of May, while the canal was being filled for the opening of navigation three days later. This break was caused by the imperfect construction of the State street sewer, built by the city (to connect with the pipe culvert); the foundation of this sewer was laid in quicksand, the side walls were badly built, leaving open joints that allowed the quicksand to waste away through these walls, and was then carried through the culvert and sewer below into the river. This waste caused the berme bank to break away. To secure it against a similar accident, a channel was exca-

vated parallel with the line of the canal, near the upper end of the pipe, to the original foundation (of said culvert), six feet in width and fifty feet in length; sheet-piling driven on both sides of this channel and the space between filled with concrete, up to the water line in the canal, making this work secure and permanent.

On the thirteenth day of August last, a break occurred at the culvert on the Port Byron feeder, about one-fourth of a mile below the feeder dam, caused by the culvert's being too short to receive and support the bank properly. This culvert was lengthened and the bank repaired without interrupting navigation on the Erie.

#### DISASTERS.

On the seventh of September, the light-house at the mouth of Ithaca harbor was burned down. No one seems to know how or in what way this structure was fired, whether by accident or design. Preparations were at once made by the superintendent to replace it by the old one at the head of Seneca lake, which was found in such state of repair as to justify its removal to the Ithaca pier.

#### ENCROACHMENTS ON STATE PROPERTY.

In most of the cities and villages on this division the property owners adjacent to the canals have put up, some temporary and others permanent, buildings (in whole or in part) on the lands of the State; and, in some instances, narrowed the towing-path so as to interfere with the navigation of the canal, making it difficult for teams to pass each other at certain places.

Some plan should be adopted and pursued to maintain an unobstructed path for the full width of the lands owned by the State (if need be), for the free passing of teams employed in towing boats, leaving no cause for complaint from those who now are inconvenienced by these obstructions. The interests of the canal require that some measures should be devised to put an end to these encroachments.

The practice of throwing manures and ashes and piling old lumber upon the towing-path in the towns and cities has become a common affair, and all these manures and ashes are washed into the canal, not only forming obstructions along the path but obstructions in the canal itself, the removing of which is attended with considerable expense (annually) to the State.

The encroachments on the berme side are not so objectionable, as they do not interfere so much with the working of the canals, still they often interfere with the passing of boats when a large business is being done.

In the cities of Syracuse and Utica, most of the large warehouses are located where there is no extra width of waterway, making it difficult for two boats to pass at such points where boats are being loaded.

A case of this sort can be seen every day of navigation just west of the weigh-lock in Syracuse, obstructing the way to the lock and

passing boats, which should be remedied, and the only way to do this is to require owners of warehouses to locate their buildings sixteen feet from the water line on the berme side of the canal, and for the State to construct slips 16 feet by 150 feet, that boats while being loaded may be out of the line of moving boats; why this plan was not originally adopted I am at a loss to understand.

These lands belonging to the State have been occupied for many years, and are still occupied, in one way and another, by corporations and citizens.

Take, for example, the ground occupied by the Central and Hudson River Railroad Company's freight-house, and all the tracks north and west of it to Geddes street (Syracuse), which lands are the property of the State connected with the Erie canal.

#### ADDITIONAL WATER SUPPLY NECESSARY, AND HOW TO OBTAIN IT.

The question of a better water supply has, during the present season of navigation, presented itself in so plain a manner that no one familiar with the business of the State canals can doubt the necessity of making some provision to meet the demand, by building additional reservoirs that will, with the present existing ones, hold an ample supply for a contingency arising from such a drought as has been witnessed during the present season.

Should a similar drought occur in 1880, it would be impossible (with the present resources) to maintain the navigation of the Erie canal between Syracuse and Little Falls during the coming season.

All the reservoirs in the Black river group have been drawn down this season, and all, excepting Woodhull, can be filled from the natural drainage during the coming winter and spring, while it requires two seasons to fill Woodhull. To make this reservoir available for the coming year, some artificial means must be employed to fill it more rapidly, and this can be accomplished, in my judgment, by the construction of a channel from the Bisby outlet (see annexed plan), commencing above the lower fall, thence along the side of the mountain, for a distance of 140 rods, to the head of a ravine which leads to this reservoir, thus saving the surplus water of the Bisby's and filling Woodhull reservoir, making it available in time for the next season. This ditch should be constructed the coming winter or spring; its importance cannot be overestimated. This work will cost \$12,000.

Another source of supply from this group can be had by raising the surface of White lake three feet above its present level, by means of a bulk-head at the outlet, then by lowering the outlet three feet would give at least 12,000,000 cubic feet, at a cost not exceeding \$1,600.

This lake is situated ten miles east of Boonville, a little to the north of White's Corners, and of easy access at all times, and but a short distance from the road leading to Woodhull reservoir; the waters of this lake are discharged into the Woodhull creek, and thence into the Black river above Forestport.

From the present reservoirs to Forestport, the waters struggle through natural channels much obstructed by rocks, logs and brush, and bordered by narrow strips of marshy lands that take up an uncertain amount of water, and, from the nature of things, not only retard the flow but increase the waste by soakage and evaporation.

When a small amount of water is being drawn from either of these reservoirs, it requires four days after opening the gates for it to reach Forestport, a distance of only fifteen miles; whereas, from Forestport to Rome (say thirty-five miles) it only requires thirty-six hours; this shows the importance of clearing out the channels between the reservoirs and Forestport.

There are other sources from which a supply of water can be obtained, and one of these is the Bisby lakes. By raising the embankment between the third and fourth lakes six feet above its present height would give 50,000,000 cubic feet of water, at a cost not exceeding \$5,000, and an equal amount of water could be obtained from Chub lake at a cost of \$7,500.

The last and most important improvement to be suggested for the future and successful working of the State canals is that of building a dam across the Black river at the head of the pond at Forestport. A dam built twenty feet high at this point would flow 700 acres with an average depth of seven feet, giving 213,444,000 cubic feet, in addition to the present supply. It could be filled twice during the year and be made a distributing reservoir for those located above. From it the demands of the Erie and Black River canals could be supplied on much shorter notice than can now be done from the reservoirs fifteen miles further away from the Erie.

The construction of this work, if built of stone, will cost \$80,000; a tree dam could be built for \$60,000.

From this point the water is conducted through the feeder to Boonville (ten and one-half miles), and from Boonville to Rome, a distance of twenty-four miles, through the Lansing kill, Black River canal and Mohawk river to Rome, where it is taken into the Erie.

The Black River canal, north of Boonville, has been closed sixteen days during the present season for want of water, and the same thing may occur the coming season if Woodhull reservoir should be but half full in May next.

All the reservoirs in the Hamilton group are drawn down very low, but these can be filled during the coming winter and spring.

A very important improvement, in connection with this group, would be to close the outlet of Woodman pond and raise the water to the height of the summit level of the Chenango canal (now used as a feeder), and fill said pond in the spring during the time of floods.

This improvement would give 26,000,000 cubic feet of water, in addition to what is now made available from the reservoirs already existing in the Hamilton group, the waters of which pass through the Chenango canal and Oriskany creek into the Erie at Oriskany.

This reservoir, being located so much nearer the Erie canal than

all others in this group, could be made a distributing reservoir, and a supply could be obtained when needed in much less time than under the present system; and this supply would be more uniform and consequently less wasteful in maintaining the proper depth of water on the Long level of the Erie.

This improvement can be made at a trifling expense, as most of the lands that would be flooded are of little value for any purposes whatever.

I would again recommend that the State take the control of the Owasco dam, and also the Skaneateles dam and feeder, and regulate the discharge of water from these reservoirs during the season of navigation, and at all other times, as the interest of the State may require.

Also, that the State resume the control of Skanandoa creek, which a few years ago was connected with Oneida creek, just above Oneida Castle, by a cut through a low and narrow ridge between these creeks. This would add thirty per cent to the present supply through the Oneida feeder, and would aid much in maintaining the western end of the Long level.

Another source of supply can be had by connecting Canachagalia lake with the North Lake reservoir, by cutting through a low ridge between these lakes, by which means the waters of Canachagalia lake (which now flow to the north into Moose river and thence into Black river) can be turned south into North Lake reservoir, and made available for supplying the canals.

I Cannot now say what amount of water this lake would furnish, but enough is known to justify a careful survey and examination of it and its surroundings, and, if found to be as it appears, then to construct a dam and spillway in the natural outlet, and an artificial channel with bulk-head and gates at the south end of said lake. This reservoir would be available when North lake is exhausted, and it need not be used till then.

The proposed improvements would add to the amount that can be stored in the reservoirs already constructed and in use 564,888,000 cubic feet (to say nothing of the Canachagalia lake), as follows:

NAME OF RESERVOIR.	Estimated cost.	Supply, cubic ft.
White Lake reservoir (filled once).....	\$1,800	12,000,000
Bisby Lake reservoir (filled once).....	5,000	50,000,000
Chub Lake reservoir (filled once).....	10,500	50,000,000
Woodman pond (filled twice).....	8,500	26,000,000
Ditch between Bisby falls and Woodhull reservoir.	12,000	

I would therefore recommend that the improvements of White lake and that of the Bisby lakes (and the ditch between Bisby Falls and Woodhull reservoir), Chub lake and the raising of Woodman's pond be made as early in the coming season as it is possible, to secure a full supply for navigation in the autumnal months.

## PROPOSED RESERVOIR AT FORESTPORT.

Estimated cost, \$80,000; supply (filled twice); cubic feet, 426,888,000.

This reservoir should be built the coming year, which would secure a permanent supply under any contingency.

While the supply west of Syracuse (if rightly managed) is in excess of the demand, the supply east between Syracuse and Little Falls is barely sufficient in a dry season (like the present), with the best management, and should this season be followed by another equally dry, it would be impossible to keep up navigation on the Rome level, and levels east between Utica and Little Falls, and at the same time maintain navigation on the Black River canal north of Boonville (virtually closing the Black River canal, as most of the business done on it is in shipping lumber from the country bordering the Black river north of Boonville).

Little is known of the water-sheds that supply the State reservoirs, or of the capacity of many of them, or the amount of water that the tributaries afford during the summer months; and nothing but a careful survey can give a correct idea of their real value as feeders to the canals.

As the supply has been equal to the demand for many years (previous to this season), but little thought has been given to this question which now imperatively demands attention.

While it will require more extended surveys and calculations to determine accurately what further provisions should be made, to meet the demands of the canal, enough is already known to warrant the opinion that with the improvements proposed an ample supply can be obtained, while there is a strong probability that a judicious selection can be made from the improvements named that will meet all the requirements of the canal between Syracuse (lock 47) and Little Falls (lock 39) for the coming year, should it chance to be as dry as the present.

ESTIMATE OF WATER SUPPLIES FOR PROPOSED DEEPENING OF THE ERIE CANAL, BY RAISING THE BANKS ONE FOOT AND LOWERING THE BOTTOM ONE FOOT BETWEEN THE LOCKS AND AQUEDUCTS, SO AS TO GIVE NINE FEET DEPTH OF WATERWAY.

*Basis for calculations, from experiments by former Engineers.*

*First* — That the loss by evaporation, filtration and leakage at mechanical structures of the present canal is two hundred cubic feet per mile per minute.

*Second* — That for proposed enlarged canal the loss will be as the square root of the depth of water and as the area of the surface pressed.

*Third* — That 150 lockages at each lock indicates the amount required for operating the canal.

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*Dimensions of present Canal.*

Dimensions of the present canal are as follows:

Seven feet deep, fifty-two and one-half feet on bottom, with side slopes one and one-fourth to one. Area of surface pressed for each lineal foot of canal, seventy-five feet.

*Dimensions of proposed enlarged Canal.*

Dimensions of enlarged canal as proposed will be nine feet deep, fifty feet on bottom, with side slopes one and one-fourth to one. Area of surface pressed seventy-eight and nine-tenths feet.

It is assumed for these calculations that in lowering the bottom of the present canal one foot, the width on bottom will be fifty feet, which would be the case were it not necessary to leave a small earth bench to support the toe of the slope walls, which do not extend below the canal bottom, as established for seven feet of water.

*Quantity of water required for enlarged Canal.*

First considering the surfaces pressed to be the same in both canals, and the variation to be only in the depth of water, the filtration, etc., would be  $57 : 59 :: 200 : 226.76$  cubic feet per mile per minute, but as the areas pressed will not remain the same, the corrected quantity will be  $75 : 78.9 :: 226.76 : 238.55$  cubic feet per mile per minute as the amount required for proposed canal.

*Present Water Supply.*

The feeders supplying the middle division of the canals can be best considered as divided into two groups. The eastern group furnishing the demands east from the city of Syracuse as far as lock 39 at Little Falls, and the western group, that portion west from said city as far as lock 52 at Port Byron.

The Syracuse and Montezuma levels will have an ample supply from the number of lockages that will be taken as a basis for these calculations, and therefore need not be considered.

*East of Syracuse, fed by Eastern Group of Feeders.*

Name of Feeder.	Quantity in cubic feet per minute.
Butternut Creek feeder (natural flow for 220 days).....	500
Jamesville reservoir (for 60 days).....	2,000
Limestone Creek feeder (natural flow for 220 days).....	500
De Ruyter reservoir (for 100 days).....	7,000
Chittenango Creek feeder, Oazenovia Lake and Erieville reservoir (for 100 days).....	2,526
Cowassalon Creek feeder (natural flow for 220 days).....	200
Oneida Creek feeder (natural flow for 220 days).....	1,000

Rome feeder, including Black River reservoirs (for 220 days).....	13, 000
Oriskany Creek feeder, including Madison County reservoirs (for 220 days).....	6, 000
Lion feeder (natural flow for 220 days).....	800

Reducing these supplies to a common period of 220 days, the length of the ordinary navigation season, the total cubic feet per minute will be reduced to 26,876.

### *Demands for Lockages.*

Double locks, of 11 feet lift, will draw from each end of the levels fed by these feeders.

Capacity of two double locks, 11 feet lift, will be  $18. + 18.92 \times 11. \times 110 \times 4 \text{ No.} = 89,346$  cubic feet, and  $\frac{89,346 \times 150}{24 \times 60}$  gives 9,307 cubic feet per minute, as the quantity that will go east and west for lockages.

Then  $26,876 - 9,307$  leaves 17,569 cubic feet per minute to supply filtration, evaporation and leakage for 80.21 miles of canal, and  $\frac{17,569}{80.21}$  gives 218.91 cubic feet per mile per minute.

This quantity would be more than sufficient for the demands of the present canal, unless during an exceptionally dry season like the present; or, again, were it not for the serious draught upon the portion of the canal under consideration by reason of the quantity constantly required, under chapter 346, section 33, Laws of 1859, to be fed on the Syracuse level for the efficient working of pumps or other machinery for raising salt water from the wells and reservoirs now constructed, or which may hereafter be constructed, on the Salt Springs reservation, amounting to 5,500 cubic feet per minute, ordinarily, and when the water is needed most for the purposes of navigation, that is during the period of greatest evaporation on the reservoirs, feeders and canal, the demand for pumping purposes increases in a like proportion to supply the evaporating works of the coarse salt companies.

We have found the quantity that will be required for proposed enlarged canal for the 80.21 miles, between locks 47 and 39, to be 238.55 cubic feet per mile per minute, and the amount that can be furnished by the existing reservoirs and streams to be 219 cubic feet, a deficiency of 19.55 cubic feet per mile per minute, requiring an additional reservoir capable of supplying 1,568 cubic feet per minute for a period of 100 days.

It is calculated that the ordinary flow from the natural streams will furnish the extra quantity needed for the remaining 120 days.

This deficiency can be made up as follows:

First, by constructing the ditch or feeder between Bisby Falls and Woodhull reservoir, and by raising the spillway of this reservoir two feet, which will give 107,680,320 cubic feet, or 748 cubic feet per minute, for 100 days. The estimated cost of constructing ditch, \$12,000; raising spillway, \$500.



Next, turning the waters of Canachagalia into North lake would, no doubt, give 250,000,000 cubic feet, or 1,736 cubic feet per minute, for 100 days. Estimated cost, \$10,000.

Should the State decide to run the salt pumps by steam power, the 5,500 cubic feet per minute now taken for that purpose from the west end of the Long level would be saved to the canal, and would obviate the necessity of building a reservoir west of Rome for supplying this level, as the amount diverted to run the salt pumps and the amount obtained from Woodhull and Canachagala would be sufficient for the enlarged canal, when added to the quantity obtained by the improvements proposed for the maintenance of the present canal.

*West of Syracuse, fed by Western Group of Feeders.*

Jordan level, 14.91 miles long.

Name of Feeder.	Quantity in cubic feet per minute.
{ Nine Mile Creek feeder (natural flow 220 days).....	800
{ Otisco Lake reservoir (for 120 days).....	6, 975
Carpenter Brook feeder (natural flow for 220 days).....	200
Skaneateles Creek feeder and Skaneateles lake (for 120 days)	8, 776
Port Byron level, 7.79 miles long.	
Putnam Brook feeder (natural flow for 220 days).....	200
Owasco Creek feeder (natural flow for 220 days).....	4, 033
Owasco Lake reservoir (for 220 days).....	2, 000
Total supply reduced to a flow for 220 days.....	<u>15, 824</u>

*Demand for Lockages.*

Double locks, of 8 feet and 11½ feet lifts, will draw from each end of these levels.

	Cubic feet.
Lock 50 (double), 8 feet lift, has a capacity of.....	32, 261
Lock 52 (double), 11½ feet lift, has a capacity of.....	46, 754
Total.....	<u>79, 015</u>

Then  $\frac{15,824 \times 150}{24 \times 60}$  gives 8,231 cubic feet per minute as the quantity that will go east and west for lockages.

Again, 15,824 total supply, less 8,231, leaves 7,593 cubic feet per minute to supply filtration, etc., for the Jordan and Port Byron levels, a distance of 22.70 miles, and  $\frac{7,593}{1.5}$  gives 334.44 cubic feet per mile per minute, or enough for proposed enlarged canal.

An increased supply, however, can be readily obtained either from Owasco or Otisco lakes. In fact, a large surplus from Owasco lake is now wasted over the State dam at Port Byron. It would be better, however, to obtain any additional supply that may be required from the Otisco Lake reservoir, and bring it into the Jordan or Summit level for distribution.

This lake flows 2,200 acres and has a drainage basin of 22,000 acres. By constructing a bulk-head across the present stone spillway,

and raising abutments and earthwork sufficient to hold back two feet more water in the lake, 600 cubic feet per minute can be obtained at an estimated cost of \$10,000.

### *Engineering.*

Besides the ordinary duties of this office requiring frequent inspection of the canals on this division, and making of plans for the use of the superintending department and overseeing the work while being done, the engineers of this division have been engaged in the special work of surveying and inspecting all the bridges on this division of the Erie canal and have made a record of the results. This record gives the span, elevation and width of each bridge, also the kind of material and condition of the structure with every dimension of all parts of each bridge in detail.

As few, if any, of the plans of these bridges have been preserved, this record is valuable for reference, and gives the necessary data for making out bills of timber and plans for rebuilding when the old bridges fail.

The making of surveys and preparing maps for the use of the canal appraisers called for in the State's defense, in cases of canal claims, has taken a good deal of time and careful attention. Having been called upon to assist in the defense of more than one hundred cases during the fiscal year, most of which have required surveys and triplicate maps for the use of the appraisers.

These cases have involved every conceivable question likely to arise from breaks in the canal, leakage through the canal banks and the overflowing of streams connected with, or in proximity to the canals and rivers in any way affected by the State works on this division.

The sixty-eight claims against the State on the Chenango extension have occupied several months in surveys and levels to determine what possible damage could arise from raising the Rock Bottom dam across the Susquehanna river at Binghamton in 1871, two feet and three inches above the old dam, and in surveys of claims below said dam growing out of the construction of said extension. As most of the landmarks on this work were obliterated the work was made the more tedious and protracted, involving much more time than at first seemed necessary, but the large amount claimed for damages on this work fully justifies the labor and expense in opposing them and defending the State against unreasonable demands.

To make these surveys, maps and plans has required additional help during the time the work was being done, as most of the force doing ordinary duty were occupied on work undergoing repairs, such as dams, bulk-heads and other improvements requiring daily attention and careful supervision.

Surveys and levels have been made to ascertain how a larger supply of water can be obtained to meet the demands of the canals under any contingency that may arise through the failure of any one of the sources from which supplies are now obtained.

Respectfully submitted,

MARVIN PORTER, *Division Engineer.*

## WESTERN DIVISION.

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### ANNUAL REPORT OF THOMAS EVERSHED, DIVISION ENGINEER WESTERN DIVISION STATE CANALS, FOR FISCAL YEAR ENDING SEPTEMBER 30, 1879.

ENGINEER DEPARTMENT, WESTERN DIVISION, }  
ROCHESTER, N. Y., *October 1, 1879.* }

Hon. HORATIO SEYMOUR, JR., *State Engineer and Surveyor:*

SIR— In accordance with the regulation established by act chapter 169, Laws of 1862, in relation to the engineer department, I have the honor of presenting to you my report on the western division of the State canals for the fiscal year ending on the 30th of September, 1879.

#### *Canals and Navigable Feeders.*

These are, by the abandonment of the Chemung and Genesee Valley canals, reduced to the following number of miles:

	Miles.
Erie canal from Buffalo to east line of Wayne county .....	148.90
Genesee Valley canal in city of Rochester .....	1.90
Genesee River feeder in city of Rochester .....	2.25
Total .....	153.05

#### *Unnavigable Feeders.*

	Miles.
Tonawanda and Oak Orchard Creek feeder .....	11.55
Genesee Valley canal from Cuba reservoir to lock No. 87, .....	7.65
Genesee Valley canal from Scottsville to Rochester .....	11.00
Total .....	30.20

*Water Supply.*

This is received at the following places:

1. Lake Erie at Black Rock.
2. Tonawanda creek at Pendleton.
3. Tonawanda and Oak Orchard Creek feeder at Medina.
4. Genesee Valley canal at Rochester.
5. Genesee River feeder at Rochester.

The sources are as follows: from

*Lake Erie.*

This lake, having an area of about six thousand square miles, is of course an inexhaustible source of supply and quite sufficient to furnish all the water wanted for canal purposes from its entrance into the canal proper at the guard lock at Black Rock, to the Montezuma level, where the water from the west meets the water from the east.

It is liable to frequent fluctuations, which however, very seldom render it too low to supply water sufficient for the use of the canal to Montezuma.

It is sometimes from various causes not possible to send it forward the whole of that distance, and water from other sources has to be taken in to supply the deficiency.

One of these reasons is an easterly wind, which, on the Long level east of Lockport, sets the water back.

Another is the immense growth of eel-grass which, on that level of 62½ miles in length, and on two other levels, the "Seventeen" and "Twelve" mile, so called, retards the flow of the water so as to render it extremely difficult to force forward the required amount, notwithstanding the efforts made by the canal authorities to destroy the grass by mowing it under water.

From Black Rock the canal follows the shore of the Niagara river for a distance of twelve (12) miles, when it enters Tonawanda creek near its mouth; Tonawanda creek has been raised about four (4) feet above its original level and also that of the Niagara river, into which it empties itself; this was done in order to make a slack-water navigation up the stream for twelve (12) miles to the village of Pendleton, at which point the canal leaves the creek and passes through the deep earth and rock cuttings for seven (7) miles, to the point in the city of Lockport where it descends fifty-six (56) feet by five combined locks, to what is called the "Long level," between that place and Rochester.

In the ordinary stages of water in the creek, the current in the twelve miles is reversed by the water from Lake Erie.

At Pendleton the canal receives the waters of

*Tonawanda Creek.*

This stream has generally been called a source of supply, but I think erroneously so, as, unless the water is high, it is all diverted from the stream by a dam some miles above and turned through the

Tonawanda and Oak Orchard feeder to Medina, and but very little or none at all, ordinarily enters the canal at Pendleton, the supply for the canal there being usually from Lake Erie.

### *Tonawanda and Oak Orchard Creek Feeder.*

Consists of a dam across the Tonawanda creek; a bulk-head in the open cut about a quarter of a mile from the dam, built to keep back the flood waters of the creek and prevent them following down the feeder; an excavated channel through a swamp to Oak Orchard creek, a distance of 4.05 miles; the excavated channel of Oak Orchard creek, partly through rock, 3.20 miles; the natural channel of Oak Orchard creek past the falls of Shelby Centre, a descent of about sixty (60) feet, 3.20 miles; the raceway from the dam across Oak Orchard creek to the Erie canal, 1.10 miles; in all a distance of 11 $\frac{55}{100}$  miles of feeder and creek channel.

The dam at the head is composed of timber, brush and gravel; it has stone abutments; the bulk-head also has stone abutments.

Both of these structures require some repairs, as to stone and timber work.

The excavated channel has become much obstructed by the growth of willows and filling in of bars of earth; it should be cleaned out.

In that case it is capable of discharging 1,600 cubic feet per minute from the Tonawanda into the channel of the Oak Orchard, and thence into the canal.

This feeder has been quite useful in helping to fill the canal in the spring, and also in case the canal is drawn off during the season of navigation, as was the case in June last.

Until this season, it has not been called upon during the past few years to supply the canal with water, except in so far as that is received into the canal which passes over the wheels of mills which discharge into the canal, probably about one-half the total amount coming down the excavated channel.

The supply above described is received at a point sixteen and three-quarters (16 $\frac{3}{4}$ ) miles below Lockport, or about one-quarter the distance from that place to the first lock below Rochester.

### *Genesee Valley Canal.*

Since the abandonment of the Genesee Valley canal, the supply of water from the Genesee river at the Mount Morris dam has ceased, but a small quantity has been received from Allen's creek, at Scottsville, and brought down through the prism of the canal a distance of ten and three quarters (10 $\frac{3}{4}$ ) miles. This is necessary to keep sweet the water in that portion of the Genesee Valley canal lying in the city of Rochester, which has the same surface level as the Erie, is connected therewith and consequently has to be kept full.

The amount obtained from this source is about 1,200 cubic feet per minute, and assists materially to keep up the lower end of the Long level."

*Genesee River Feeder.*

The source of supply for this feeder is from the Cuba or Oil creek reservoir, which formerly supplied the Summit level of the Genesee Valley canal, and the Rockville reservoir.

It is situated on the east side of the river in the city of Rochester, and is two and a quarter ( $2\frac{1}{4}$ ) miles in length. It has a dam at its head which is so constructed that, when not in use for the purpose of turning the water from the river into the feeder by means of flush-boards, will let the water run through almost as freely as though no dam existed.

This dam has substantial abutments of masonry.

There is also, at the head of the feeder, a bulk-head containing four gates; it also has stone abutments.

The feeder itself is about fifty (50) feet wide and five (5) feet deep.

Until the last two seasons this feeder had not been used for some time to supply the Erie canal with water during the summer months, for many years, but it was used only to assist in filling the canal in the spring of the year.

Of late years, however, the growth of eel grass in the canal has proved to be much more than formerly, and it has been found to be such an obstruction to the water-flow as to render the use of this feeder necessary to keep up the lower end of the Long level between Lockport and Rochester; the flush-boards, therefore, have been put on and the water from the river forced through the feeder, to assist in keeping up the levels and supplying water for the lockages below Rochester; and there is no doubt but what it will be always required for that purpose in the future, as the large number of boats which have navigated the canal for the last two seasons has proved that there is no fear that the business of the canal will retrograde if properly fostered and encouraged by suitable and efficient management.

Both the dam and bulk-head require some repairs; in the former three of the bents which support the flush-boards have been carried away and should be replaced. The gates of the bulk-head also require repairing and the embankment at the west end raised and strengthened.

The banks of this feeder are too low, they should be raised three feet and thoroughly protected on the river side by rip-rap; there is danger of the river water in flood time breaking over again as heretofore, and damaging private property.

Already heavy sums have been paid by the State on that account.

Last spring the water broke over the banks in no less than seven (7) different places, luckily in no place more than a few inches in depth, so that it was kept under control by a small force of men.

Should it break over to any great extent, it would flood a large portion of the twelfth ward of the city of Rochester, and not only inconvenience the inhabitants by filling their cellars, etc., but greatly damage property especially between the river and the feeder.

The feeder has not been cleaned out for a number of years, it has long been the receptacle of all manner of uncleanness thrown in by the inhabitants on its banks. It should be thoroughly cleaned out.

The proper way to raise the banks would be to dredge the bottom out and place the dredged matter on the west bank, and if that does not afford enough material the rest could be obtained from the east side; this operation would at the same time clean out the feeder and destroy the aquatic plants which infest it, hinder the water-flow and make it unhealthy.

At any rate, it should be well cleaned out, if not by dredge then by hand; the canal authorities owe this to the inhabitants on its banks for salutary reasons.

Since the Genesee Valley canal is abandoned and the diminished supply through it from Scottsville will soon be entirely stopped, the necessity for keeping this feeder as a means of supplying the amount of water formerly had through that canal is imperative, inasmuch as it will be the only means by which the water from the reservoirs up the valley can be conveyed to the canal.

About the first of July it becomes necessary to put the flush boards on the dam and turn the water through the feeder, as by that time the eel grass has acquired such a size as to obstruct, as mentioned before, the flow of water in the canal.

At or about the middle of September the grass ripens and floats away, the dam can then be removed or rather the flush boards can be taken out, as there is no difficulty then in procuring water in ample quantity, and whenever there is an excess of water in the canal, a case of frequent occurrence, for the destruction of the grass, and consequent unimpeded flow of water down the Long level together with diminished evaporation caused by the advance of a cooler season tends to that end, then the surplus waters can be wasted through the gates at the head of the feeder; this will create a current and keep the water sweet.

To reach the same end, if the current thus created is not sufficient, gates can be put in at a point where a culvert exists through the east bank of the feeder above Clarissa street bridge, the feeder water can thus pass through the gates into the culvert which takes it to the river; these gates being on the east side, the west or river bank will remain intact.

The feeder water is generally one foot above the river water when the latter is low, a state very likely to occur in the fall of the year; when this is the case and the bulk-head gates are raised the flowing of the water is up stream; this has led to the impression that the feeder is of no use, and to an effort on the part of the inhabitants of the portion of the city adjoining it to have the feeder entirely abandoned.

This effort on their part I have no doubt would be given up, if they should clearly realize its importance and the necessity of retaining it as a very valuable auxiliary to the successful navigation of the canal, taking as it does the waters of the reservoirs

retained by the State for that purpose, and conveying them into the canal.

### *The Cuba and Rockville Reservoirs.*

The Cuba, or as it is sometimes called, the Oil Creek reservoir, is located in the valley of the creek of that name, and formerly supplied the Summit level of the Genesee Valley canal, by which the waters found their way into the Erie canal.

The dam which holds back the water is situated about two miles above the village of Cuba, is 2,200 feet in length and 65 feet in height where it crosses the original channel of the creek.

The area of water surface is 605 acres with a mean depth of 20 feet; the storage capacity is 527,214,000 cubic feet at full stage of water.

To control the flow of water into the feeder below there are two pipes, each twenty inches in diameter, provided with necessary stop cocks, etc., passed through the base of the bank; to take off the surplus water a waste-weir is placed some distance from the dam. This waste-weir discharges into a smaller creek channel which, in its turn, discharges into Oil creek, some two miles below Cuba village.

After leaving the pipes, the water intended to go north is sent down a feeder about three-quarters of a mile into the canal on what was the Summit level; here a dam has been put across the canal to turn the waters northward. The waters then flow down the canal, passing several locks, for a distance of seven (7) miles, when, at lock No. 87, it is turned into the channel of Black creek.

### *The Rockville Reservoir.*

Is situated just above lock No. 87, contains a water area of 72 acres; it has a dam twenty (20) feet in height; is supplied with water from Black creek; its storage capacity is 18,223,000 cubic feet.

Together, these reservoirs are capable of furnishing to the Erie 580,000,000 of cubic feet, or forty three hundred (4,300) cubic feet of water per minute, for the three driest months in the year, or one-half more than has been received by it from the Genesee Valley canal at any one time.

The yearly expense of retaining them will be small, less in fact, than the interest on the money necessary to be expended if they are abandoned. At the Cuba reservoir alone, the expense of restoring the creek to its natural condition, by removing the dam, would entail the excavation of thirty thousand (30,000) cubic yards of earth.

The original channel of the creek, through the village of Cuba, has been filling up during the years in which the reservoir has had existence, and some expense would have to be incurred in order to restore it.

This, with the excavation of the dam, would amount to about seven thousand (\$7,000) dollars; the interest on which will keep up and tend both reservoirs.



A small expenditure has been incurred this year in repairs on the house over the valves and the removal of one of the valves, to take out a piece of wood wedged in it, which obstructed its working.

I have been thus particular in giving the reasons why the feeder at Rochester and these two reservoirs should be retained, as possibly an effort for their abandonment may be repeated in the legislature during the coming winter.

In regard to the Oil Creek reservoir, the State will use its own water, stored up in its own reservoir, at a time of year when there is a surplus over the wants of the millers on the stream below; consequently the mill owners can have no right to it, even if they had not been paid already for the diversion of the natural waters of the creek, which I understand was the case when the reservoir was constructed.

The water is drawn off at a season of the year when there is but very little running in the creek, as will be seen by measurements made in the summer of 1834, when there was only thirty-six cubic feet per minute, and again in 1838, when there was eighty-one (81) cubic feet per minute, a trifling quantity, which is more than compensated to the millers below by the retention of the waters arising from heavy rains being kept back in the large reservoir (during those months wherein the State is not drawing water), and flowing off slowly over the spillway before mentioned, instead of flowing off rapidly through the creek if the reservoir was destroyed, which would be the case if abandoned by the State; as I have no doubt the inhabitants of Cuba village would strongly object to its remaining; holding this immense quantity of water ready to overwhelm them, unless under the proper management of the State authorities.

They would consider it too dangerous a neighbor to leave unwatched and untended.

### *Consumption of Water.*

The amount of water made use of in the navigation of the canal would, of course, be dependent on the quantity of water used in locking boats, if that quantity exceeded the loss by evaporation and filtration.

The lockage on this division is all to the eastward or down from Lake Erie, and the supply, if the flow was uninterrupted, would be all from that lake.

The amount of evaporation and filtration on the Montezuma level and the Cayuga canal dependent on it for supply, is equal to twenty-six miles of canal seventy (70) feet in width; which, allowing two hundred (200) cubic feet per mile per minute for the days of greatest evaporation, amounts to about 7,700,000 cubic feet per day, exceeding the amount furnished to it in any one day at present by the lockages of the two locks situated at each end of the level, namely, the Port Byron lock (No. 52), of 11.417 feet lift, at the east end, and the Clyde lock (No. 53), of 4.75 feet lift, at the west end.

The greatest number of lockages this season, up to date, averaged 88 each way.

The evaporation and filtration is equal to the lockage of 100 boats each way.

The amount of water sent on to the Montezuma level, as measured on the twenty-fifth of September last, perhaps a fair average of what is usually sent, was 17,500,000 cubic feet, or more than twice as much as the amount required for evaporation and filtration, which should be the governing amount.

On that day the number of boats was seventy-five each way, and as seen above, not enough to supply by lockages alone the amount required for evaporation and filtration.

The amount wanting from lockages alone had to be made up by drawing through the culvert between the locks, or through the paddles in the lock-gates.

It was by the latter method, as it is found to be more economical to draw through the paddles in the lock-gates themselves, as thus the lock-tenders are more careful to shut down as soon as the level below their lock is full; and they have therefore been restricted to draw through the paddles alone.

The large amount sent forward is, however, not all passed through in that way, as it would require one paddle to be open to its full extent for twenty-two (22) hours per day, under a nine feet head; whereas, the lock-tenders only report the drawing through one paddle for seven hours.

The balance of the drawing of one paddle for a space of fifteen hours is to be attributed to leakage of the paddles themselves, between the gates and the mitre-sill and through the culverts between the locks.

There are eight paddles in the Clyde lock under a head of 3.75 feet, and eight (8) in the Port Byron lock under a head of 10.417 feet.

The enormous amount of water thus wasted would seem to require a new paddle of more perfect construction, and that some means should be taken to tighten the joints between the gates and the mitre-sills, as well as the culvert gates.

If these leaks are stopped by having perfectly fitting valves and joints, there would then be a large amount of water sent forward in excess of what is required, namely, about 9,700,000 cubic feet; but allowing for a moderate amount of leakage, there would still be a surplus of about 6,000,000 cubic feet per day.

Former canal engineers, in making their calculations of the water required in locking boats, have usually assumed that two lockfulls will lock three boats; actual count has proved this to be very nearly correct.

The boats which navigate the Erie are built so nearly to the size of the lock chamber, that there is very little space between them and the side-lock walls, and when the level below the lock is at its proper height there is only one foot between the boats' bottom and the mitre-sill: consequently it is found to be very difficult indeed to start the inert masses, fitting, one may say, in the lock like a plunger in a pump. Therefore, when a boat is about to enter a

down lock it is usual to assist her by drawing with one of the paddles in the lower gates, and in leaving, to flush her out with one or two paddles of water from the upper level through the upper gates; by these means the amount of water used is largely increased, but the time consumed in locking is greatly reduced.

For instance, the amount used and the time consumed is shown by the following tables:

No.	Name of lock.	Lift in feet.	Contents in cubic ft.	Used in drawing in cubic ft.	Used in swelling out cubic ft.	Total cubic ft.	Proportion to contents.
53	Clyde .....	4.75	10,500	10,000	15,500	36,000	3.43
54	Lock Berlin .....	8.00	18,200	20,400	18,800	57,400	3.15
56	Poor-House .....	10.00	22,300	11,000	22,000	55,300	2.47
57	Lower Lockville ....	8.00	18,200	12,000	19,000	49,200	2.70

The time consumed in locking boats down through these locks, from the time the bow enters the jaws of the lock until the stern leaves the jaws below, is as follows:

No.	Name of lock.	Average on No. of boats.	NORTH LOCK.		Average on No. of boats.	SOUTH LOCK.	
			Mins.	Seconds.		Mins.	Seconds.
53	Clyde .....	6	5	48	3	6	38
54	Lock Berlin .....	4	6	23	4	6	20
56	Poor-House .....	5	6	05	4	7	00
57	Lower Lockville ....	6	5	20	1	6	00

Whereas, the time of passing the Port Byron lock, locking up, lock-lift being eleven feet five inches, was

*Port Byron Lock.\**

KIND OF BOAT.	TIME.	
	Minutes.	Seconds.
State scow, all hands assisting.....	3	35
Genesee Valley boats, average of two boats (2).....	8	40
Erie canal boat, 1 team, average of nine boats (9)...	21	52
Erie canal boat, 2 teams, average of eleven boats (11)...	16	37

If it were not for the free use of water used in thus assisting the boats in locking down, the time of making a trip would be considerably increased; the lower paddle, however, should not be used to draw the boat in until it is fairly within the jaws of the lock. As will be seen, there is more water used in this way in the case of

\* This lock is not on my division, but when there, while ascertaining the amount of water used on the east end of the level, I took the liberty of taking the time of passing boats.

the Lock Berlin lock than in that of the Poor-house, though the latter has 10 feet and the former only eight (8) feet lift, evidently from the habit of the lock-tenders commencing to draw water when the boat is still some distance from the lock.

The following table shows the amount of water required at each of the locks from the Clyde to Lower Lockville lock, after deducting the amount furnished by the Port Byron lock, and the amount of water which is at present used in drawing in and swelling out; leakage not being taken into account:

*TABLE of amount of water required to pass 150, 100 and 75 boats, respectively, each way, from the following Locks on the East end of the Western Division, using the same amount as at present to draw in and swell out Eastern boats.*

*For twenty-four hours.*

Number.	Name of Lock.	150 boats each way cu. ft.	100 boats each way cu. ft.	75 boats each way cu. ft.	AMOUNT TO BE PASSED BE- SIDE LOCKAGES.			Equal to disch'ge of 1 pad- dle in hours.
					150 boats cu. ft.	100 boats cu. ft.	75 boats cu. ft.	
53	Clyde .....	5,925,000	4,311,000	5,161,000	...	411,000	2,200,000	
54	Lock Berlin .....	9,597,000	6,861,000	6,025,500	...	...	1,223,000	
56	Poor-house .....	10,809,000	7,733,000	7,407,000	510,000	1,460,000	2,793,000	
57	Lower Lockville.	11,773,000	8,598,000	8,272,000	3,516,000	8,068,000	4,142,000	9.7% & 10%

The above is based on the evaporation being equal at all times to the days when it is at its greatest.

There are many successive days when the evaporation is far less, and, as an economy, is at all times desirable, where the consumption is so far away from the source of supply, as at this, the lower end of this division. I will recapitulate the different things to be done to assist in this economy.

First. By raising the banks on the Montezuma level so that the sides of the aqueducts, waste-weirs and lock-gates on the Cayuga canal can also be raised, thus reducing the surface descent from Clyde lock to Seneca River aqueduct, and consequently the water flow to the smallest amount necessary for waste by evaporation, filtration, etc.

Second. By new valves in the Poor-house and Lock Berlin locks, and tightening the joints between the mitre-sills and lock-gates.

Third. By placing a foreman over the three Lockville locks, to see that no unnecessary water be used day or night, and that the mill owners get no more than can readily be spared, namely, the amount in excess of lockages necessary to supply the canal below, which may readily be furnished to them by proper precautions, and that the millers shall make use of the water both night and day and not flood the level below, which is short and easily affected.

Fourth. To restrict the lock-tenders at Lock Berlin, Poor-house and the Lockville locks, in the drawing boats in and swelling them out again, to the use of the smallest amount of water possible that shall have the desired effect.

*Dams.*

There are now four (4) dams on this division.

One across the Tonawanda creek at its mouth where it empties into the Niagara river.

It raises the water about four feet, and is composed of timber, brush and gravel; it has two abutments and one pier of cut stone masonry.

Between the pier and north abutment is a bulk-head containing twelve gates, which assist in discharging the creek waters in times of flood. This bulk-head is protected by a line of piles, extending up the stream from the pier to the north shore. The dam portion has become very much out of repair; the lower timbers and plank-ing should be replaced this coming winter, as soon as the water lowers in the river, consequent upon the formation of ice at the foot of the lake.

The Tonawanda and Oak Orchard Feeder dam has been described and the needed repairs mentioned under the head of that feeder, when speaking of the water supply.

The same in regard to the Genesee River dam; as also the Cuba or Oil Creek Reservoir dam.

*Locks.*

There are twenty-four Locks, including the Rochester weigh-lock, on this division, divided as follows:

Nineteen (19) double lift locks, Nos. 53 to 71, inclusive; five (5) of which are combined together at Lockport; they are 110 feet by 18 feet in size, the lifts varying from  $4\frac{1}{8}$  feet to  $11\frac{1}{8}$  feet.

One guard-lock at Sulphur Springs, five miles above Lockport, near to where the canal leaves Tonawanda creek. It is 110 feet by 20 feet in size; consists of only one chamber with two additional head-gates of similar character to lock-gates; both of these, as well as the lock, usually stand open, only being shut when there is a flood in the creek and in the winter season.

One "river lock" at Tonawanda, a lift lock, with a single chamber, 110 feet by 18 feet. The difference in level between the Niagara river and the canal is usually four (4) feet.

One double chambered guard-lock at Black Rock, 112 feet by 20 feet. It usually has a lift of about two feet, varying according to the stage of the water in the lake.

Between the locks is a large bulk-head with gates to regulate the water in the canal.

One single chambered ship lock at Black Rock between the river and the harbor.

It is 200 feet by 36 feet, usually has a lift of about (3) three feet, varying with the stage of water in the lake and river.

One weigh-lock, situated in the city of Rochester.

The present condition of these locks, the repairs made during the past year, and the repairs now needed are as follows:

*Masonry.*

The masonry of all needs attention, fresh pointing up, etc. Many of these locks have been built nearly forty years and show on the exposed portions the effects of the severe climate of this latitude.

The constant striking of the boats has damaged the upper ends of these structures to such an extent as to require in some cases the renewal of some of the stone work, and timber or iron protection in others.

The wall at the foot of the Lockport locks is undermined and requires to be repaired by underpinning. The retaining walls on the south side of the south lock of No. 70, as well as the lock walls of Nos. 70 and 71, have been forced forward by the frost and ice in the race to the rear of it; this race-wall will probably have to be relaid and the lock chambers widened in a few years; but the time can be postponed by thoroughly bracing the lock walls apart with timbers and shoring up the retaining wall; this was done last season and should be continued.

All the locks should be thoroughly braced apart every winter, as most of them show the effects of the frost in shoving the walls forward, and the boats are now built so nearly the size of the chambers that in some instances certain boats larger than usual are barely able to pass through some of the locks.

The locks first built were provided with what was called a "big bevel" at the bottom of the lock walls, this was done away with in the later locks, and on the older ones it was cut off.

On lock No. 61, Upper Macedon, and No. 55, Lyons, this has been very imperfectly done and should be done properly, at once, as it injures the boats.

*Foundations.*

The foundations of several require to be grouted afresh, particularly north lock No. 54, north lock No. 58, north lock No. 60, north locks Nos. 67, 68, 69, 70 and 71. North lock No. 63 was so repaired last spring and a large leak thereby stopped.

*Lock Gates.*

There were fifteen sets of new lock gates put in last spring, thirteen sets will be needed next spring, also four new mitre sills, bills of timber for which have been made out and furnished the assistant superintendent of public works.

Plans for all the lock gates are being prepared, making them uniform as to the manner of framing, giving them due proportion of timber to suit the strain upon them according to the lift of the lock, and making them of the height necessary to give the requisite depth of water on the different levels.

The new gates made of late years, being copied by the local  
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carpenters from the old ones, the faults arising from carelessness or other causes have been perpetuated and increased, until they are quite faulty in construction and incorrect in size and height.

### *Valves.*

The valves or paddles in use in the lock gates are very imperfect, leaking a great deal, making it hard for the lock-tenders to work the gates against the current caused by this leakage.

In most of the locks this is the only difficulty experienced by this leakage, as the quantity of water to be sent forward would have to be drawn through the culverts between the locks, if there was no leakage in the valves, to supply the loss occasioned by evaporation below; but it does become an object to save the water in the case of the Poor-House, Lyons and Lock Berlin locks, situated as they are so near the end of the division, as the lockage water is nearly enough to supply the canal below, and the leakage is in excess of the amount required.

I would recommend that on these three (3) locks, perfect valves should be used, and that the mitre-sills should be faced on the corners with wide angle-irons for the gates to shut against, and that the lower side of the gates should be faced with India-rubber, if found necessary, to make them water-tight.

In the Lockport locks, especially in the north or upper tier, the large or culvert valves should be made thoroughly tight between the frames and the masonry, and all the valves otherwise put in a thorough state of repair; if this is done it will very much facilitate the passage of up boats, by reducing the amount of water to be passed between the loaded boat and the mitre-sill, to the mere lock-full of water, instead of having to pull it against a strong current caused by the leakage.

On the Lockport locks no valves of any kind were broken during the past season, a very unusual thing, considering that there are no less than forty-eight (48) of various kinds employed.

There has, however, been much time lost by the shafts of the pinions used in raising the culvert valves, being of different sizes; they should all be made alike, then a new pinion could be keyed on in a few minutes at any time and navigation not impeded.

At the head of the guard-lock at Black Rock, new protection piles should be driven and capped in place of old decayed ones, and the space for the passage of water should be enlarged by constructing another set of gates above the present ones.

The repairs of locks are often slighted in the spring, by reason of the large amount of water remaining in them; no means for thoroughly draining them having been provided, except to cut through the canal bank below the lock.

Pipes of cast iron should be inserted in these cuts when made, after which the locks could be thoroughly drained for repairs at any time.

*Old Lock-house Lots.*

When the locks for the enlarged canal were built, the location of some of them was so changed that the lots, one of which was attached to each old lock, had to be abandoned. These might be sold. There is one at each of the following places: Lyons, Lock Berlin, Palmyra, Pittsford, and two just east of Rochester.

*Aqueducts.*

These are four (4) in number. One at each of the following places: Medina and Rochester, with stone arches and trunk; Palmyra and Lyons, with wooden trunks for the canal water, and stone arches to support the towing-path.

The north end of the Medina aqueduct leaks badly, otherwise it is a very fine piece of work; the south end was repaired three years ago, the other should be, as the leakage by freezing endangers the whole structure.

To do this it will be necessary to dig down until the cause of the leak is discovered, and then make the defect good by grouting, etc.; also, additional masonry if found necessary.

The Rochester aqueduct has had the towing-path widened, by bolting a timber to the front of the masonry over the water, it has been newly planked with three-inch oak plank, and the front guarded by a wooden railing. This widening allows teams to pass each other without difficulty, which could not be done before. The iron railing has also been thoroughly repaired.

The timbers of the trunk of the Lyons aqueduct were found on examination to be quite defective; three broken were replaced by new ones last spring.

A bill for the whole timber work has been made out and handed to the division superintendent; this work should be done before the opening of navigation next spring.

Waste gates should be introduced into the trunk of the Palmyra aqueduct to discharge the waters of the level in case of heavy rains which might otherwise endanger the banks, as there are two large creeks which discharge into the level.

The masonry of all the aqueducts requires pointing; one piece of coping is gone from the Lyons aqueduct.

Although not on my division, I would mention that the Seneca River aqueduct is too low to give seven (7) feet of water on the lower mitre-sill of the Clyde lock or most easterly one on this division, by six inches; it has been raised two, and should be four inches more.

This would at the same time give greater ease in drawing boats into the lock at Port Byron by increasing the area between the bottom of the boats and the mitre-sill, for the passage of the water displacement made by the boat.



### *Waste-Weirs.*

There are 24 waste-weirs on this division, including the Palmyra and Lyons aqueducts.

The spillways of the waste-weirs have been carefully regulated to agree with the flow of the water in the canal and to regulate the same.

On the "Long level" between Lockport and Rochester they are too short and too few in number.

There should be three new ones, as there is a large amount of water coming into the canal from the country south of it, and in case of heavy rains this endangers the banks: The canal for the most part of the distance on the Long level lies on the side hill, having but one bank, the north one. These three new waste-weirs should be located at the following places. One at Brockville, one at Spencerport, and one at Adams' basin.

At Eagle harbor the waste gates and part of the weir were carried away at the time of a break in 1873, leaving out of an original hundred, only forty feet of spillway.

It should be restored to its former usefulness by being rebuilt as it was before, at least as a measure of precaution, for without these gates there is no means of drawing off the water for eleven (11) miles, viz., from Medina to Albion.

This is too great a stretch to leave without either more waste gates than at present, or stop gates, especially where a break could do so much damage, the canal here being one and a half times the size of the ordinary canal of seventy feet in width.

The waste-weirs at Mabee's and at Medina were thoroughly repaired last spring. Those at Middleport and Albion were pointed up and made tight, and several openings, by which water was surreptitiously abstracted, were closed up.

The Cartersville waste-weir has had its foundations repaired in part.

The coping has been stolen from the waste-weirs at Middleport and Adams' basin.

The masonry of the Lyons waste-weir requires attention; part should be relaid and all of it pointed up.

### *Bridges.*

There are 219 bridges on this division, being one less than last year. This is occasioned by the city of Rochester having put up a "lift bridge" at Allen street in the place of the former one; the city taking sole charge of the new one.

Besides the above, there are three (3) truss bridges over the State ditches at Tonawanda, and also one with a truss on one side alone, the other end of the needle-beams resting on the masonry of a culvert under the canal.

There are also fifty-two (52) small bridges over ditches kept up by the State, viz.: 25 road and 27 farm bridges. These are mostly

of small size with single spans of short lengths and without masonry abutments.

### *New Bridges.*

Bridge No. 200, over the canal at Genesee street, Buffalo, was a double track, two spanned bridge, with a pier placed squarely in the centre of the canal. This pier was the cause of many accidents to boats, the current from slip No. 2 carrying them on it. It was removed last March, and in April a serviceable wrought iron lattice bridge, of 171 feet and eight (8) inches span in the clear, 18 feet roadway and two sidewalks, was erected on the abutments.

At No. 186, Scott's Grand Island ferry, a cast iron Whipple bridge, brought from Nunda, Genesee Valley canal, provided with wrought iron floor beams, manufactured in Buffalo, was placed instead of a wooden one much decayed.

A new wooden bridge, Whipple truss, has been placed at Lineburg's farm, No. 185, in the room of one greatly decayed.

Cherry's farm, No. 184, has been condemned, taken down and timber is on hand to replace it. The iron chords of Sutherland's, No. 55, will be used.

No. 183, Three Mile bridge, a wooden one, has been condemned and will have to be renewed unless it can be commuted for.

The old wooden structure at Transit road, No. 122, very much decayed, has been removed, being replaced by a substantial wrought iron bowstring bridge.

No. 113, Orr's near Holly, a similar wooden structure has also been replaced by a like wrought iron one.

Nos. 106, 105 and 55, Cooley's basin, Brockway's and Sutherland's (the latter's chords going to Cherry's), three old wooden decayed bridges, have been replaced by good cast iron bowstring ones, all obtained from the old Genesee street bridge, Buffalo.

No. 37, Clark's farm, has been rebuilt of wood.

### *Condemned Bridges.*

An examination of the bridges on this division, made during the summer, has shown that the following bridges will have to be renewed at once:

No. 198, over slip No. 3, Buffalo, a wooden structure much decayed, can be replaced by a cast iron Whipple bowstring, at present over the Genesee Valley canal at Cummingsville.

No. 96, Hiscock's, wooden, can be replaced by a cast iron one at present at Hinsdale, Genesee Valley canal. By doing this a saving of \$300 will be made over that of building a new bridge, and that after filling up the Genesee Valley canal and building a small culvert in the bottom under a road, where the Hinsdale bridge now stands.

The following wooden bridges are condemned and should be replaced by wrought iron ones at once:

No. 133, Allen's, highway, near Eagle Harbor.

No. 130, Gaines' basin, highway.

No. 112, County line, highway, between Orleans and Monroe.

No. 89, Four Mile grocery, highway.

No. 39, Road and tow-path change, near Macedon.

No. 38, White's, highway, also near Macedon.

No. 35, Tow-path change, near Palmyra.

No. 14, Cole's, highway, near Lyons.

No. 11, Goetzman's farm, near Lock Berlin.

No. 6, Sigman's farm, near Clyde locks.

No. 3, Waldruff's, highway, east of Clyde.

Allerton's highway, No. 26, which can be replaced by one from the Genesee Valley canal, viz.: the Railroad Avenue bridge at Mount Morris.

This Mount Morris bridge is a particularly good one of the kind, and the abutments of Allerton's are the only ones on this division of the Erie which it will fit, where a wooden one is required to be renewed.

Horton's highway, No. 10, has been condemned and is to be replaced by a cast iron bowstring, the contract for which is now let.

This has been done without the concurrence of the engineer department.

Great progress has been made of late years in the science of bridge building. Wrought iron and steel have, in all the older countries, replaced wood and cast iron as both more stable and durable.

As the law now stands, the only bridges allowed to be built, as I read it, are the "Whipple cast iron" and the "Whipple wooden bridges."

The life of the latter is about ten to twelve years, and most of the former that have been erected have only a factor of safety of from two to two and one-half.

A wrought iron bridge, with a factor of safety of five (5), can be built for about the same amount of money.

Most of the wooden bridges, as given above, were built about ten or twelve years ago; these, as well as many others, must soon require replacing.

I would recommend that you, Sir, cause a bill to be introduced into the Legislature changing this law, so that the State may have the benefit of the improvements of the present age in this respect, and that all plans for the repairs or renewals of structures, whether of bridges or otherwise, shall be prepared under the direction and have the approval of the State Engineer and Surveyor.

The bridge at York street, in the city of Buffalo, has a pier in the centre of the canal, similar to that formerly at Genesee street, Buffalo; quite as many boats have been wrecked on it as at Genesee street. It is the purpose of the Superintendent of Public Works to remove this pier and substitute a bridge of one span. I heartily concur in this.

The tow-path change bridge at Rochester, near the weigh-lock,

has also a pier in the centre of the canal, which often causes damage to boats; this should be removed. One of the spans of the present bridge can be used on the Erie canal to replace a farm bridge now much decayed, the other span can be lengthened for a similar place.

The following bridges require repairs to their superstructures :

No. 174, Pickard's, and No. 173, New Home, require thorough overhauling.

No. 163, Main street, Lockport, some of the ends of the main and secondary braces are decayed and should be spliced.

No. 161, Pine street, Lockport, has a trapezoidal truss ; water has run down inside of the hollow cast iron columns supporting the truss, and freezing, has, by expansion, cracked them. The columns should be replaced by new ones and the openings so covered that the water cannot again destroy them. The whole of the planking requires renewal.

This bridge has been considered unsafe and the roadway has been braced from below ; it is placed over the locks and the bracing is very much in the way of working the locks. It should be properly repaired next spring.

On bridge No. 115, an iron one, situated at Holley, the wooden needle-beams are decayed and should be replaced by iron ones ; eight 8) still left from the old Genesee street bridge, Buffalo, could be used for this purpose.

The following bridges require new joists and planking :

No. 84, Lyell street, Rochester.

No. 71, Court street, Rochester.

No. 69, Griffith street, Rochester.

No. 63, Monroe avenue, Rochester.

The following bridges require new planking throughout as well as some other repairs :

No. 68, St. Paul street, Rochester.

No. 17, Water street, Lyons.

No. 16, Church street, Lyons.

No. 15, Geneva street, Lyons.

On the following list of iron bridges the wooden needle-beams are much decayed and should be replaced by wrought iron ones :

No. 139, Church street, Medina.

No. 71, Court street, Rochester.

No. 69, Griffith street, Rochester.

No. 67, Alexander street, Rochester.

No. 53, Road from Pittsford to Palmyra.

No. 46, Main street, Fairport.

Other repairs are needed on the following bridges :

No. 30, Port Gibson.

No. 18, Leach's, Lyons.

No. 17, Water street, Lyons.

No. 191, Amherst street, Black Rock ; cast iron overhead braces should be replaced by wrought iron ones.

The wooden approach to Amherst street bridge, Black Rock, burned down December last past, has been replaced.

No. 192 Mill street, Black Rock, is on wooden bents and piles; these should be replaced by stone abutments.

The pile abutment of the "Lift tow-path" bridge over Ellicott creek in the village of Tonawanda has given out; this should be replaced by one of masonry, the stone for which should be delivered this fall.

No. 80 Allen street, Rochester; at this street crossing the city authorities have removed the old Whipple Cast Iron Bowstring bridge, replacing it by a wrought iron "Lift bridge" which is a great improvement on a swing bridge, there being no obstruction offered to navigation or the passage of water. It is operated with great facility, being raised in twenty seconds for the passage of boats.

### *Masonry of Bridges.*

The bridge abutments on this division are very much out of repair. Some years ago boatmen were in the habit of using a hook or grappling iron and many stones were displaced by the habit of hanging on to the abutments with these hooks, in some instances the stones were thrown down into the bottom of the canal where they yet remain; in others, they have been stolen for horse-blocks and door-steps; in no case have they been replaced. The lack of care in this respect is to be deplored.

Some of the berme abutments have been struck by boats and the masonry thereby shattered.

A small force of masons in a boat with proper appliances and materials would in one or two seasons make this good.

The following bridges have the masonry injured; the stone is at hand, merely requiring to be replaced; the abutments should be properly pointed up:

Nos. 7, 8, 12, 13, 14, 22, 26, 54, 55, 58, 90, 91, 97, 100, 104, 108, 112, 113, 119, 120, 126, 130, 131, 135, 138, 141, 142, 143, 146, 148, 150, 151, 152 and 155.

At the following bridges some stones are gone, mostly stolen, although some are in the bottom of the canal:

Nos. 1, 2, 3, 4, 5, 6, 9, 17, 19, 20, 21, 27, 29, 35, 41, 42, 43, 47, 48, 49, 50, 51, 56, 57, 59, 60, 61, 67, 69, 87, 88, 89, 92, 93, 94, 95, 96, 101, 103, 105, 106, 111, 114, 116, 118, 122, 124, 129, 132, 133, 134, 136, 137, 144, 147, 153, 154, 159, 169, 184, 185 and 186.

At the following bridges the berme abutments are shaken by the boats striking them. These bridges are in points where boats are exposed to the wind and the striking in some cases unavoidable. Piles should be driven to prevent future damage:

Nos. 3, 10, 21, 29, 35, 36, 38, 41, 42, 48, 49, 57, 58, 60, 61.

No. 198, over slip No. 3, Buffalo. The north abutment of this bridge is in a bad condition; it is held together by tying it back to the embankment. It should be relaid.

No. 178, over the Slip to the river lock, Tonawanda. The western abutment of this bridge is going over at the top; for the present this should be tied back into the bank, it will soon have to be relaid on a new foundation.

Culver road bridge No. 62. This bridge's south abutment has never been finished, requiring wings, also rip-rap on each side of the approach, to prevent the wash of the adjacent "wide waters" from encroaching on it, etc.

The banks also should be widened, they are both narrow and dangerous to teams using the road; several serious accidents have occurred at this place.

The displacement of the coping on the abutments has the effect of allowing water to penetrate into the masonry; its chief object is thus done away with; it should in every instance be replaced.

No loose stone has been placed behind the masonry. Between it and the earth backing in the rear, at many of these abutments; consequently many are being displaced by frost action; in two cases the abutments have been anchored back by timbers run into the bank to prevent their going out entirely, and in several other cases they are liable to slide out if heavy rains should occur and the water should get in behind them.

### *Stop Gates.*

There are seven (7) stop gates on this division.

LOCATION.	Direction it holds the water to.	Style of gate.
Medina .....	West .....	Tumble gates.
Holley .....	West .....	Tumble gates.
Holley .....	East .....	Mitre gates.
Adam's basin .....	East and west .....	Mitre gates.
Rochester .....	East and west .....	Mitre gates.
Cartersville .....	West .....	Tumble gates.
Bushnell basin .....	East .....	Tumble gates.

The masonry of these gates requires pointing up.

The foundation at Adams' basin should be grouted. That at Bushnell's basin requires new slide-gates on the berme side.

There should be three (3) more stop-gates constructed on the "Long level" between Lockport and Rochester.

In June last, when the water had to be drawn off for repairs of culvert west of Orangeport, thirty-seven miles of canal had to be exhausted, equal, in consequence of its increased size, to fifty-five

miles of canal of seventy (70) feet width; all of which would be drained in case of a break occurring in the distance between Lockport and Medina.

### *Culverts.*

The following culverts on this division require repairs:

The wing-walls of Cornelius Creek culvert, about a mile east of Black Rock, have been badly torn asunder by the ice in the Niagara river, and should be repaired.

The culvert at Murphy's farm, near Sulphur Spring, which conveys the water from one of the back ditches into the canal, has given way. It was partly repaired under the last Canal Commissioner; the balance, that portion below water, should be finished next spring.

The north parapet and wings of a double arched culvert in Lower Lockport have parted from the arch of the culvert.

At Wakeman's, two and a half miles below Lockport, the north end of a small arch culvert requires repairs to both foundation and masonry.

The north parapet of the Road culvert, between Medina and Knowlesville, has been pushed off by the frost.

About half a mile west of Main street, in the village of Albion, some years ago, a break occurred, carrying away one-half of an arch culvert of six feet chord. The canal end of the culvert was closed up and a bank put across the towing-path. The culvert has never been rebuilt; the want of it has thrown more water toward the next culvert than it can carry; the consequence is that the lands and houses in the vicinity are flooded. It should be repaired and its usefulness restored.

At Main street, in the village of Albion, a slight leak has occurred in a culvert which should be reduced by grouting or puddling; perhaps both will be required.

The frost has had the same effect, as in the Road culvert, on a culvert three-fourths of a mile west of McCarthy's bridge, near Holley. The same obtains in both parapets of the culvert at Allen's creek, just east of Rochester.

At Wise's Creek culvert, the first one east of Pittsford lock, the north-east wing has fallen down and the parapet at the north end displaced; both will have to be relaid.

The coping-stones from many of the culverts have been removed by the grapnels of the boatmen before the practice of using them was stopped; many have been stolen. The object of coping on these and like structures, as mentioned before, is to preserve the masonry. They should certainly be replaced where wanting.

On the twenty-sixth of June last, the water undermined the timber box culvert a short distance west of Orangeport, to repair which the canal had to be drawn off. It was built on a red sandstone foundation, probably hard when first excavated, and well calculated to mislead an inexperienced engineer as to its durability; it had, however, decayed and been washed out from under the side timbers until the water formed a passage. It was repaired and navigation resumed by July third.

*Vertical Walls.*

A stretch of vertical wall, about sixty-five feet in length, situated on the south side of Commercial slip, in Buffalo, fell into the same. The stones have been dredged out and foundation piles driven. The wall will be replaced at once.

The walls through the city of Buffalo and harbor of Black Rock are very much out of repair; much of the stone forming them was taken from the adjoining excavation and have decayed.

A supply of suitable stone should be kept on hand for repairing these walls at such times as the subsidence of the water of the Lake will allow it to be done.

At the Eight Mile grocery, west of Rochester, two pieces of vertical wall on the towing-path side were put in, without the knowledge of the proper authorities, by the owners of the adjacent groceries, using only the stone from the slope wall; these walls have fallen down.

They should be properly constructed and placed back so as not to encroach on the waterway.

In various villages the walls which have been forced in by the frost and fallen down have been repaired in the usual manner.

In Fairport, a stretch of wall about 100 feet in length, berme side of canal, in front of a warehouse, has been replaced by one heavier, the extra stone required were furnished by the State and the whole was laid in cement by the owners of the property.

Soon after the opening of navigation in the spring, a leak occurred through the cemented vertical wall at Exchange street, in the city of Rochester, flooding some cellars; it was stopped by grouting the wall and puddling behind it.

*Prism of the Canal.*

The bed of the canal, towing-path side, was, with slight exceptions, thoroughly cleaned out last spring, from Shelby basin to near Lock Berlin.

That portion of the Perrinton swamp section left untouched last year, was cleaned out.

Rock to the extent of nearly 1,000 cubic yards was removed from the canal bottom, near Cooley's basin, and 550 cubic yards, just below the first lock east of Rochester (No. 66). This has been of great assistance to navigation; about 3,000 cubic yards more should be excavated in various places to complete this work.

The bed of the canal has for many years been gradually filling up, the silt accumulation far exceeding the amount annually taken out, or capable of being taken out by the means usually employed for that purpose, namely, hand labor done before the commencement of navigation.

The survey of the canal made in 1876, when soundings were taken its whole length, and an estimate based on those soundings through this division, made by my predecessor, gave — as necessary to restore the canal, not to its original size but sufficient area for necessary



waterway for the proper passage of boats,— a removal of 544,000 cubic yards of material.

This western division is situated mainly on side hills. Frost and other elementary action, during the years which have passed since the enlargement, now some twenty-two, have started the slopes on the berme side carrying the slope-walls with them.

Independent of the relaying of many yards of slope-wall, it would take much more excavation than the above-named 544,000 cubic yards to restore the prism to its original size.

The 544,000 cubic yards may safely be augmented now to 625,000 cubic yards, three years having elapsed since the estimate was made, and estimating 30,000 cubic yards per year in excess of what has been taken out each spring.

This large amount of material constantly accumulating, shows the necessity of adopting some method of removal other than that hitherto employed.

I would recommend that it be taken out by means of a dredge, by which almost all spots can be reached; only a few places are beyond its reach, namely, under bridges, where there is a rock bottom, and around masonry; thus plenty of places are left where the repairs can be executed by manual labor.

The economy of doing this work by machinery during the summer months over that of the spring of the year, is so well established that dredges are in use for that purpose on almost all the other canals of this country as well as in Canada.

The advantage to be derived from this method, besides its economy, is that the material can be used where it will do good in strengthening the banks, a thing which is very much needed in many places.

The necessary plan consists of a *dredge, barges or boats, with water tight decks* to carry the material away, *boxes with hinged bottoms* into which the material can be dumped while on the decks of the boats, and a *derrick* for unloading the boxes and dumping the material on to the banks.

The cost of the same may be estimated as follows :

One dredge.....	\$10, 500
Three barges and boxes, at \$2,000.....	6, 000
One derrick.....	3, 500
<b>Total.....</b>	<b>\$20, 000</b>

The expense attending the working, exclusive of repairs, is :

On dredge, per diem.....	\$13 00
On boats, including team, per diem.....	10 00
On derrick, per diem.....	10 00
One foreman over all.....	3 00
<b>Total.....</b>	<b>\$36 00</b>

The usual amount of daily excavation and placement on the construction work, Welland canal, is six hundred (600) cubic yards.

The chief engineer of the harbor commission, Montreal, Canada, in speaking of one piece of work mentioned in his report for the year 1878, says as follows: "The portion of the main shoal dredged to twenty-three (23) feet depth of water in 1877, was deepened to twenty-five (25) feet at low water; cost  $14\frac{4}{16}$  cents per cubic yards." This material was of course dumped in the usual way in deep water; but here was a large expanse of hard material deepened only two feet, about the depth of excavation required in removing a very soft material from the bottom of the Erie canal.

I, therefore, think it may be safely said that this work can be done for the same money in seven (7) feet of water, notwithstanding delays from passing boats and frightened teams, namely:

Per cubic yard.....	$14\frac{4}{16}$ cents.
Add for use of derrick in unloading scows, instead of dumping material, per cubic yard.....	$5\frac{1}{16}$ cents.

Thus we have a total per cubic yard ..... 20 cents.

At \$36 per day expense, it would require the excavation of 180 cubic yards per day.

I am satisfied that it can be done for even less than twenty (20) cents per cubic yard, less than one-half what it costs to do it by hand.

The number of week days during the season of navigation is 190, this, at 200 cubic yards per day, equals 38,000 cubic yards per year.

To bring the canal to a proper condition in six years would require a removal of 100,000 cubic yards per annum, or as much as two such dredges can take out besides hand labor, at a cost for dredging of about \$15,000 per annum for each dredge.

### *Towing-path.*

The graveling of the towing-path can also be done by the same dredges. It was never properly done in the first instance or kept up as it should be, it being a physical impossibility that six laborers with a repair scow can keep twenty miles of towing-path in good order and attend properly to the other things required of them.

There are a number of gravel pits which only can be got at by a dredge. For instance, there is a very good gravel bed at the head of Black Rock harbor, opposite York street, from whence that portion of the canal lying between the city of Buffalo, Black Rock and Tonawanda village can be graveled.

There is a fine bed of gravel at the head of White's island, in the Niagara river, about one-quarter of a mile from the river lock, from which the towing-path lying on Tonawanda creek could be graveled.

This has always been a very bad towing-path, nothing having been done on it in the way of graveling for years.

Last fall about 1,200 lineal feet of this towing-path, near Pendle-

ton, was paved with refuse stone from the Medina quarries, making a good foundation for a bed of gravel.

At Millard's, three miles east of Lockport, on the east side of the Irondequoit embankment, at a point three miles west of Newark, and at a point one mile west of Clyde, there are pits which, for various reasons, can only be got at to advantage by a dredge.

For some miles east of Lockport the canal banks have, during all the years since first constructed, gradually settled and wasted away until they are becoming unsafe. They should certainly be raised and strengthened.

About four miles west of Rochester there is a berme bank which should be strengthened for a distance of six hundred feet and rapped on the inside slope; this summer a narrow escape from a serious break took place, the bank on the outside sliding for about (70) seventy feet.

The banks at Bushnell's basin are composed of an unctuous material very liable to slide.

To prevent breaks, the inside of the canal has been filled with gravel to such an extent as to reduce the water area, thus making it difficult to force water through to supply the canal below.

The outer bank slopes should be reinforced, the prism restored to its original size, the sides sheet-piled, the bottom lined, and the whole placed beyond a contingency, as far as future safety is concerned.

The towing-path bank just east of the village of Palmyra has shown signs of sliding, it has been partially secured by loading the foot of the slope heavily with stone, brush and earth.

This should be continued until the whole is entirely secure.

### *Erie Basin.*

This basin, situated at the entrance of Buffalo harbor, contains about thirty-three acres of water area, it was formed by inclosing a portion of Lake Erie by the construction of a heavy pier of cribs 2,244 feet in length, surmounted by stone work, protected on the lake side by a foreshore of heavy stones; on the north by a "jetty pier" leaving an entrance of nearly five hundred (500) feet, and on the south by the United States Government Pier. Three wharves lie on the east side, inside of the Breakwater.

It was built by the State as an enlargement of the Harbor capacity of Buffalo, rendered necessary by increased canal business.

It has ten feet depth of water, the amount required by the heaviest lake craft at that time; now the draft of water of the largest craft is fifteen (15) feet.

This basin is the receptacle of old and worthless hulks, not only of canal boats, but of lake-going crafts. They have, from time to time, been removed, but others take their place; there is one there now which should be removed. This should not be permitted, as they are a serious obstruction to navigation.

The space occupied by this basin deeded by the city authorities to the State in 1849, for the purpose of forming such a Basin, was, although covered by water at the time of such grant, mostly within the shore line of the first city survey.

In order to give the various docks surrounding the Basin on the south and east sides the required depth of water, these docks have been so moved forward that individuals are now occupying the lands so conveyed to the State.

I would, therefore, respectfully call your attention to this fact, as well as to that all along the line of the canal, the same thing obtains, namely, that private individuals are using lands within the blue line; and suggest that as the title to these lands rests in the State, they should be leased to the parties occupying them, in order that the State's title in them should remain unimpaired in the future.

*Dredging Canal Basins, etc., in the City of Buffalo.*

Ohio basin in dimension is one thousand (1,000) by five hundred (500) feet.

The Erie basin is two thousand (2,000) by eight hundred (800) feet; the State keeps up a channel through and leading to the same of three thousand (3,000) feet in length by three hundred (300) feet in width.

Black Rock harbor, south of Ferry street, is six thousand (6,000) feet in length by one hundred and fifty (150) feet in average width. North of Ferry street its length is six thousand (6,000) feet in length by four hundred (400) feet in width.

The total area of basins and harbor is one hundred and forty five (145) acres.

The Hamburg and Erie canals, together with the various slips connecting with them, contain about sixty-five (65) acres. Altogether, a total of two hundred and ten (210) acres, or thereabouts.

The settlement of material in this large area is from various causes very great.

That in the Ohio basin and the Hamburg and Erie canals being at least thirty thousand (30,000) cubic yards per annum (erroneously printed 3,000 in my last year's report).

This deposit in a great degree is the result of the emptying of the city sewers into these places, accumulating yearly nearly six (6) inches in depth.

The deposit of material in Black Rock harbor is also very great, it having now almost entirely filled up the harbor, save where a channel is kept open by dredging for the passage of vessels.

In the keeping of the canals, basins and harbor open, and to prevent the future accumulation of silt-deposit, there is use for a tug-boat, dredge and necessary dump-boats all the time.

The approaches to the Erie basin as well as the basin itself should be deepened, so as to allow free passage for lake vessels and enable them to lay up at the wharves.

During the past season a portion of the Hamburg canal has been cleaned out by dredging, as also the Erie canal from Commercial slip to Georgia street.

### *Buffalo Sewerage.*

Last year I had the honor of reporting to you the condition of the sewerage of the city of Buffalo, whose whole sewage is emptied into the Erie canal.

It is a question of such importance that I will again speak of it, as with the increasing growth of the city this increasing evil is continually forcing itself upon the attention of those engaged in any way with canal navigation; the boatmen and their families who live on the canal being not the least sufferers thereby.

The question of a trunk-sewer to convey the sewage matter from the 12,000 acres of the city now draining into the Hamburg canal has been brought up in the common council, but nothing definite as to a plan has been arrived at.

The city should adopt some definite method of getting rid of this nuisance and promptly act upon it, as of late establishments have come up for the manufacture of articles, the refuse of which is used to feed many hundreds of cattle, whose ordure materially adds to the already pestilential nature of the contents of the sewers.

The city and canal authorities, for the benefit of those looking to them for sanitary measures in this behalf, should come to some understanding. The whole of this refuse matter should be collected together and passed under instead of into the canal, and thence to the river.

The city authorities are about letting the "Bird avenue sewer," the contents of which, draining as it will 4,000 acres of territory, will be emptied into the canal unless some measures are taken by the canal authorities. I would respectfully call your attention to the necessity of having this passed under the canal and harbor, a plan for which was made by the engineer department and an appropriation therefor passed by the last legislature but vetoed by the Governor.

I might add that this sewer is seven feet in diameter, all of which need not be passed under the canal, a five foot diameter pipe being quite sufficient; the rest, in times of extreme flood, can pass into it without injury.

### *Bird Island Pier.*

In my last report I stated that repairs were needed on this pier. About 900 feet in length requires to be strengthened and overhauled; in several places the stones composing it are nearly all gone from the portion above water, and it is somewhat doubtful if another season's ice freshet does not carry off the remainder and cause a break. One that occurred three years ago cost \$7,000 to repair. It should be attended to at once.

*State Yards.*

The necessity for the State's owning suitable yards for storage purposes is quite apparent, the present ones being both too small and inconvenient and without suitable shops.

At Lockport timber sheds have been constructed during the past summer.

On the river side of the yard near the Weigh-lock, in Rochester, a substantial stone wall laid in concrete has been built and the whole fenced in; a blacksmith shop and lumber sheds are in progress of construction.

There also should be a suitable carpenter's work-shop erected.

At Palmyra, the long disused State yard has been fenced in and a shop built; this shop was put up without any consultation with the engineering department and is open to great improvement. It should have been so made that a lock-gate, after being put together, can be turned over and the irons put on both sides without taking the gate to pieces again.

The above, as far as now carried, are improvements that were very much needed.

*Old Canal.*

A portion of the old canal through the village of Holley, Orleans county, has been maintained in navigable order ever since the enlargement was completed, in consequence of a law requiring that this should be done where the new canal was taken away from the old one through incorporated villages, in order that the inhabitants should still have the benefit of canal navigation.

A part of the old canal at this point, for about half a mile in extent, has for years been a dangerous piece to look after, and has been totally disused for canal purposes.

Last spring it was closed up by placing a substantial earth embankment at each end.

This still leaves the village of Holley the use of the other portion as before.

The disused part should always be retained by the State, as, by the work of a few hours, it could at any time be made useful to carry on navigation in case of any mishap to the heavy embankment which exists on the new canal at this place.

There are two places on this division where the waters of the canal set back, causing sickness to the neighboring inhabitants. One is at Cataract Spring, half of a mile west of Gasport, the other just east of Fairport.

These should be drained; the expense in each case would be about \$350.

*Unoccupied Lands.*

There is a small piece of property in the city of Rochester still remaining which belongs to the old canal and which is entirely removed from the new one, it is situated at the east end of the old aqueduct.

The rest of this property has been given up to the adjoining owners on payment being made. The piece remaining might be sold, being quite valuable, lying as it does on one of the principal streets of the city.

In the year 1843, a break occurred in the village of Tonawanda carrying away a portion of the land forming the village, for which damage, under chapter 222, Laws of 1844, payment was asked and received.

This property, consequently, belongs to the State of New York. It consists of lots Nos. 1, 2, 3 and 4, in the triangle or block No. 4, in that village. It has for many years been occupied by individuals who have erected buildings thereon. There is no reason why the State should not sell this property.

I would respectfully recommend that you cause legislative action to be had on this and other like cases.

### *Genesee Valley Canal.*

This canal was abandoned by the State at the close of navigation last fall.

Although it was as regards its uses thus abandoned as a canal, there was still much work to be done on it in order to render it safe from doing damage to private individuals.

A large number of its bridges have been removed and embankments with culverts underneath built where required.

Two substantial cast iron bridges have been removed and transferred to the Erie canal where they will replace decayed wooden ones; one from Nunda and one from Mount Morris.

There are four (4) more which will fit abutments on the Erie. These should be transferred, which can easily be done, effecting a large saving on the cost of new structures of a similar character.

I will mention the following work yet necessary to be done to render this canal safe from damaging private property:

The removal of aqueduct trunks at "Little Beard's creek" and all those between Mount Morris and Dansville.

The construction of permanent earth dams in the guard-locks at Portville, Oramel and Mount Morris.

The canal banks at the double arched culvert at "Beard's creek" should be cut away to permit the passage of the creek water, as the culvert chokes up with gravel during freshets.

The retention by the State of the Cuba and Rockville reservoirs has already been spoken of under the head of water supply for the Erie canal.

Also, of the necessity for continuing the use of water from Allen's creek, Scottsville, to keep sweet that portion of the Genesee Valley canal which lies in the city of Rochester and is connected with the Erie canal.

I would also recommend the retention of the two lower locks in the city of Rochester, the stone of which can be used in making needed repairs on the Erie.

*Chemung Canal.*

The whole of this canal was abandoned at the close of navigation in 1878.

A portion lying within the city limits of Elmira was surrendered by the State to that city by act of Legislature in 1875.

The six miles south of the village of Horseheads had been virtually abandoned some years ago, by the construction of a dam in that village which prevented the water from flowing south of that point.

The following work has since been done to restore the original state of things as much as possible, and preclude the possibility of damage accruing to private property by reason of the canal's having been abandoned :

A heavy embankment across the head of the guard-lock at Gibson, and the tearing away the waste-weir between the canal and the river near said guard-lock ; also, the construction of a dam across the canal, just below the waste-weir, to prevent the waters of Gibson creek following down the feeder.

The removal of the "Wormley" waste-weir to allow the flow of the accumulated waters of several small creeks out of the feeder into the Chemung river.

The removal of the aqueduct over "Sing Sing" creek.

A heavy embankment has been constructed across the feeder, in the "deep cut," to prevent the water from following the feeder toward Horseheads.

At Horseheads, the head wall of the lock at the foot of the feeder has been removed, and the towing-path restored where cut away by a freshet had in December last.

A heavy dam has been constructed across the canal, about one mile north of the village of Horseheads, to prevent the waters of Newtown creek from following down the canal.

A road embankment has been made by the inhabitants of the village of Horseheads, at the south end of the village.

The waste-weir at the south end of Horseheads has been lowered so as to leave about two feet of water for fire purposes.

A dam has been put in at the head of lock No. 15 ; also forming a road across the canal. The waste-weir at the same place has been removed.

An embankment has been made across the canal and a waste-weir removed at the head of lock No. 2.

The aqueduct over Fall creek at the head of lock No. 1 has been removed and the head wall of that lock torn down so as to let the waters of the creek through the lock.

The level between locks 1 and 2 in the village of Havana has been ditched.

Eleven (11) road and four (4) farm bridges have been removed and embankments formed instead, across the canal ; culverts, when necessary, have been placed under the embankments.



There still remain (17) seventeen road bridges which require to be so served.

The following other kinds of work still require to be done :

To fill in the waste-weir at Mundy's creek.

To restore the waters uninterruptedly to their original channels, dive culverts should be removed at "Winter's" and "Gardner's" Creeks.

A question of considerable importance arises in consequence of the Erie railroad by its grades diverting waters from their natural courses and turning them into the feeder at the lowest point where the different grades meet above the village of Horseheads; thus causing a quantity of water to flow down the feeder that would not otherwise do so.

When the canal was in existence this did no damage, but now it is liable to do so.

The State in self-defense should close up the channel between the railroad and the feeder and hereafter let the railroad company make its own channel, carrying with it its own risk of damages, otherwise the State might be assumed as bearing the responsibility.

Another question of importance arising, consequent upon the abandonment of this canal is, what is to be done in regard to the docking at Corning? It was built by the State, and is very old and much decayed, in two places it has fallen down, to replace which would require eighty and sixty feet respectively of new docking and piles.

The inhabitants of Corning claim that the State is under obligation to keep this docking in repair in consequence of its having raised the water in the river for canal purposes, and that, unless the docking is kept up, the river is liable to overflow its banks in time of floods and do much damage to the adjoining property.

I understand that the original dam belonged to a mill property just below the then village of Corning, and was from (3 to 4) three to four feet in height, and that it was located above the present State dam which was made six (6) feet higher, and consequently covered up the old one; a guard-bank was constructed across to the higher ground and gates with substantial stone abutments introduced into it to supply, as before, the mill with water.

On the other side of the river the guard-lock is situated at the upper end of the feeder.

The raising of the dam made a slack-water navigation in the Chemung river extending to the upper end of the village of Corning, a distance of over a mile and three-quarters.

The river which in times of high water filled its banks at this place before the erection of the dam, was now found to overflow them, thus necessitating the raising of the south bank by the construction of a levee to prevent the floods going across the point of land formed by a turn in the river and running into it again below the dam.

The embankment was protected by a timber docking both for the purpose of keeping it from washing away and to accommodate the lumber and other business done on the canal.

If this docking disappears from decay, the embankment will slide down until it assumes a slope natural to the material of which it is composed, and the wash of the water in the river, and be less in height than it is at present.

To keep it up will require constant attention and repair; which if not attended to will be likely from the above-mentioned subsidence to result in floods breaking through, an event which took place some years ago, carrying away with it large quantities of earth, for which and other damage done, the State paid for.

The keeping up of this docking which is about seven-eighths of a mile in extent will require an expenditure of from \$2,000 to \$4,000 every year.

The people of Corning claim that the State has not only permanently raised the water in the river by the maintenance of the dam but has reduced the width of the stream from 1,100 or 1,000 feet to 600 feet; the latter being the length of the dam; and that consequently the water in flood times is much higher than it would be, if the dam was removed and the original dam restored.

Besides keeping up the docking, there are two ways of obviating the difficulty :

*First* — To buy out the mills and destroy the dam entirely; and

*Secondly* — To take down the present dam to the height of the original one and restore the water to the height at which the State found it.

If the annual cost of keeping the docking, in repair, say \$2,500, was capitalized at six per cent it would exceed \$40,000.

If the State is still liable for damages to individuals for the result of any overflow, it would be cheaper to cut down the dam at once to the height of the original one; this would not cost more than \$12,000.

I would, in that case, recommend that it be done. In the mean time, the breaks in the docking should be repaired in the cheapest manner possible to obviate the possibility of a break through the bank.

#### *Navigation of 1879.*

The navigation on this division has been uninterrupted, except during the time the water was drawn off for the repair of the culvert west of Orangeport, mentioned under the head of culverts, namely, from June 26th to July 3d, and for about five hours on September 21st, when a small break occurred on the berme bank of the canal just east of Newark, which was soon repaired and the water restored to its proper height.

During the first months of navigation the forwarding business was in a languishing condition, latterly it greatly improved. Large quantities of grain are being sent forward to the seaboard, and, from present appearances, the boatmen will have every occasion to rejoice at the revival of their business, both as regards the amount of freight transported and the pay for doing it.

*The Future.*

The amount of canal business done for the past two years clearly demonstrates that no apprehension need be felt that its use will be discontinued in the time to come, if it is wisely and economically managed, its repairs judiciously made, its business fostered and its boatmen encouraged and assisted in their endeavors to procure freights, both east and west, without having to pay too large a commission for the same. The terminal facilities enlarged and the cost of elevating the grain established on an even basis of a half cent per bushel, there can be no fear but what this great artificial highway, taking the place as it does of a natural strait between the Lakes on one side and the Ocean on the other, and navigated like those large bodies of water by a free marine, will always continue to fill the office of the great regulator of the cost of transportation between the producing territories of the west and their markets in the east.

But in order to lend its aid, the navigation of the Lakes beyond its western terminus, must be unimpeded by obstructions. |

An obstruction, and one of a serious nature, now threatens it, namely, the construction of a draw-bridge across the Detroit river, proposed to be built for railroad purposes.

That a heavy blow will be dealt to the navigation of the lakes by the construction of such a bridge there can be no doubt.

The navigation of Lake Superior may be said to be but just commenced. The immense territory to the north and west of this lake, the finest wheat growing portion of the continent, whose products must come through that channel, are only just being opened to settlement. They will add greatly to the otherwise natural increase of the Lake trade.

The question of bridging or tunneling the river is merely one of expense. No unsurmountable engineering difficulties exist to the latter method; both can be used for railway traffic with equal facility; both are capable of doing the same amount of business.

The committee appointed by Congress state that no bridge can be built without being of some interruption to navigation.

The navigation of this natural waterway has existed, free to all and without interruption, since the first exploration of the lakes by the "French Fathers" to the present time.

Then why interrupt it at all? especially if it is to endanger or serve as a drag on that free commerce which regulates and lowers the cost of transportation, a thing the inhabitants of so many States, both east and west, are interested in. Or, in other words, why tax the people of all the northern States, putting the proceeds of that taxation into the pockets of corporations who so well know how to take care of themselves?

The five or six thousand boatmen who navigate the canal, and the owners of the many vessels doing the carrying trade of the lakes, are not powerful because they can only act as individuals, and lack the concentration necessary for an united effort of the kind necessary to successfully combat the heads of wealthy and powerful corpora-

tions. They must look to the legislatures of the several States for assistance in the matter.

You, sir, I think, are the proper person to call the attention of the Legislature of this State to this danger.

The existence and success of the navigation of the lakes, and of the Erie canal as part of the system, being thus of national importance, it will, as the population of the country increases, proportionally increase in importance. One has only to look back for the past thirty years to see this.

Any thing that will tend to lower the cost of transportation on this, the canal portion of this great route, serves to foster the trade and commerce of the whole.

The time to doubt the durability or the future increase of traffic on this canal is past.

No *niggard or cramped-up policy* should prevail in dealing with this great thoroughfare.

The Erie canal does not owe the State of New York one cent, although the prosperity of, and rise of the State of New York to be the first State in the Union, dates back to the time of the construction of the Erie canal.

Every cent earned by it in the way of toll, should be *freely expended upon it*, first to keep it in good repair and make good the ravages of this very severe and trying climate upon its structures and banks, and secondly, to improve it gradually in such a way as to lessen the cost of transportation.

Any thing that will lessen the traction of a boat through the water will shorten the time consumed in making a trip and lessen the cost of transportation.

This can easily be done by lowering the bottom and raising the banks and the surface of the water, thus giving more space between the boat and canal bottom, each day's work contributing toward the desired result. And I would respectfully recommend that this work next in importance to the enlargement already accomplished be at once commenced and carried on to completion.

While the statesmen of Europe are again turning their attention to the improvement of their internal water channels, and while the opening of the Suez canal and its effects on the commerce of the Eastern Hemisphere have led to the renewal of the project of making a water communication across the isthmus which exists between the two western continents; can the people of the State of New York afford to let the advantages pass away which have already been acquired by reason of the building of this great highway, quite equal in importance to either of the two last named; seeing that it is the principal water communication between the commercial metropolis of the country and the great chain of lakes penetrating, as they do, more than half-way across the widest part of our continent and that which must prove to be the most populous portion of the same.

A loss of much trade already gained, and a diversion of much in the future which otherwise might be secured, will result from any supineness in this respect in the face of the improvements inaugurated in their system of water communications by our northern neighbors, and which are steadily progressing toward completion, viz.:

### *The Canadian Canals.*

In view of the near approach to completion of the Welland canal which will therefore soon make itself felt in competition with the Erie, I have thought best to repeat, in my present report, the history of that canal as given last year in my account of the Canadian route.

### *The Welland Canal.*

"The upper entrance of the Welland canal is at Port Colborne, on Lake Erie, twenty miles above the head of the Niagara river; its direction is north and south, nearly parallel with that river. Its lower entrance is at Port Dalhousie, about eleven miles west of the mouth of the Niagara river. It has twenty-seven locks with a total rise of 326½ feet.

"The first agitation in the Upper Canadian parliament in regard to this canal was in 1816, when an unsuccessful attempt was made to have money appropriated for surveys, etc. In 1818 the inhabitants of the Niagara district petitioned the legislature for a canal between Lake Ontario and Chippewa, on the Welland river.

"In 1819 provision was made for surveying the St. Lawrence canal route, the Welland being considered as one of them.

"In 1823 a commission recommended that the dimensions of this canal should be such as to accommodate the vessels navigating the lakes, all of which in 1824 resulted in the formation of a company to construct the canal.

"After various delays arising from a variety of causes, principally those of a financial character, the canal was opened in 1829 so that vessels passed from one lake to the other by way of the canal, the Welland and the Niagara rivers. The canal was completed throughout on its present line in 1833. There was a summit level fed from the Grand river, lockage being down to both lakes. There were 40 locks, all of wood, 110 feet long by 22 feet wide, except the three lower ones, which were 130 feet long by 32 feet wide, and the one at Port Colborne, which locked down into Lake Erie, which was 125 feet long by 24 feet wide. The width of the canal in the 'deep cut' was 24 feet in the bottom.

"Nothing further was done until 1841 when the union of the two provinces of Upper and Lower Canada (now Ontario and Quebec) was consummated, when the canal was placed under the supervision of the board of works. It was then decided to enlarge the canal and in 1843 the size was determined on as follows: Width of prism on bottom, 26 feet; stone locks, 150 feet long by 26½ feet

wide and nine feet of water on the mitre-sill. All of which was completed in 1848.

"In 1853 the depth of water on the mitre-sill was increased to 10 feet by raising the banks and the further lowering of the channel of the summit level through the 'deep cut' by dredging."

"This level has always been the chief point of difficulty in the economy of the canal, owing to the sliding nature of the material through which it is excavated.

"In 1867 the confederation of all the British provinces in North America took place under the name of the 'Dominion of Canada' and the canals were placed under the supervision of the 'department of public works.'"

### *Present Enlargement.*

"In the year 1871, a commission recommended the still further enlargement of this canal to the width of 100 feet on the bottom, slopes 2 to 1, inside and out, with 15 feet depth of water; the locks to be 270 feet in length, 45 feet in width, and 14 feet depth of water on the mitre-sill; the 'Summit' or 'deep cut' to be lowered so as to let the water through from Lake Erie to Lake Ontario. The enlargement has been completed, I may say, from Thorold to Lake Ontario, comprising that portion of the canal on which most of the locks are located; all being done except lock-gates.

"The remaining portion has been placed under contract and will be finished in three years from the present time."

During the time which has elapsed since writing the above, the Lachine canal has been completed with the exception of some pier and other work at its head.

The basins at its foot are completed, and Montreal can now boast of the finest canal basins on this continent, perhaps in the world, taking in as they do the largest sea-going vessels.

These basins will be brought into use next spring.

The dredging of channels through those portions of the St. Lawrence not naturally having the depth of water required, has been completed so as to give 22 feet of water at neap tide between Quebec and Montreal; in some portions 25 feet depth has been attained, the final result aimed at.

The width of these artificial channels is 300 feet.

Progress has been made on the Cornwall canal and in the channel at the "Galop rapids."

Of the Welland canal, it may be said that the finishing of only one structure stands in the way of its speedy completion; this is the aqueduct across the Welland river. It will be opened in 1881.

The grain exportation of Montreal has steadily continued to increase, but, there being no yearly report yet out, I am unable to give figures, but have been given to understand it is quite up to the former rate of progress, and that the older established lines of steamships have increased both in number of vessels and tonnage, and new ones have been formed.

It is also expected that regular lines will be established this coming season between France and Germany, respectively.

A system which, I am in hopes, will tend to lessen the cost of traction and reduce the time of boats in passing through the Erie canal is about being inaugurated by private enterprise, namely, *the Belgian system of towing by cable.*

The company who propose to inaugurate the system have furnished me with the result of a recent trial trip made, which information I beg leave to present in another and separate report.

This department has been under the charge of Thomas Evershed and John Bisgood, as Division and Resident Engineers, respectively.

Table No. 1 contains an account of the engineering expenses during the fiscal year, which will be seen to be very nearly less by one-half than those of three years ago.

Very respectfully submitted.

THOMAS EVERSHED,  
*Division Engineer, Western Division.*

TABLE NO. 1.

*Statement showing names, rank, number of days and compensation of Engineers upon the repairs of the Western Division of the New York State canals, together with incidental expenses, during the fiscal year ending September 30th, 1879. under act chapter 169, Laws of 1863.*

ERIE CANAL REPAIRS FROM OCTOBER 1ST, 1878, TO SEPTEMBER 30TH, 1879.

NAMES.	Rank.	No. of days, etc.	Rate of compensation.	Amount.	Total.
Thomas Evershed.....	Division Engineer.....	Salary	\$3,400 00	\$3,800 00	•
" ".....	" ".....	Expenses	.....	708 80	
John Blagood.....	Resident Engineer.....	Salary	3,000 00	2,000 00	
" ".....	" ".....	Expenses	.....	388 79	
W. H. Odell.....	Assistant Engineer in charge.....	17½	\$6 per day	105 00	
" ".....	" ".....	Expenses	.....	41 07	
W. N. Radenhurst.....	Assistant Engineer.....	52	\$5 per day	260 00	
" ".....	" ".....	Expenses	.....	12 87	
" ".....	Leveller.....	261	\$4.50 per day	1,174 50	
Edward E. Sweet.....	Rodman.....	32	Expenses	23 88	
" ".....	" ".....	Expenses	\$3.50 per day	112 00	
			.....	21 23	\$6,980 58
<i>Incidental Expenses.</i>					
Stationery.....				\$74 23	684 78
Fuel, light and office rent.....				405 76	
Postage and telegraph.....				88 74	
Miscellaneous.....				70 92	
Total.....				.....	\$7,624 81



TABLE No. 1 — Continued.

## GENESEE VALLEY CANAL.

*Repairs from October 1, 1878, to September 30, 1879*

NAMES.	Rank.	Number of days, etc.	Rate of compensation.	Amount.	Total.
Thomas Evershed.....	Division engineer .....	Salary ...	\$2,400 00	\$50 00	
" .....	" .....	Expenses.	.....	64 45	
Total .....					\$104 45

## CHEMUNG CANAL.

*Repairs from October 1, 1878, to September 30, 1879.*

Thomas Evershed.....	Division engineer .....	Salary ...	\$2,400 00	\$50 00	
" .....	" .....	Expenses.	.....	14 37	
Total.....					\$64 37

## SUMMARY.

*Engineering Expenses for fiscal year ending September 30, 1879.*

NAME OF CANAL.	Engineering proper.	Incidentals.	Amount.
Erie canal .....	\$6,989 59	\$634 73	\$7,624 31
Genesee Valley canal.....	104 45	.....	104 45
Chemung canal .....	64 37	.....	64 37
Total .....	.....	.....	\$7,793 13

## COMPARISON.

Engineering expenses for year ending Sept. 30, 1876....	\$15,267 82
Engineering expenses for year ending Sept. 30, 1877....	11,292 87
Engineering expenses for year ending Sept. 30, 1878....	8,720 79
Engineering expenses for year ending Sept. 30, 1879....	<u>7,793 13</u>

## CABLE TOWING.

NEW YORK STATE CANALS,  
ENGINEER DEPARTMENT, WESTERN DIVISION,  
ROCHESTER, N. Y., *December 15, 1879.* }

HON. HORATIO SEYMOUR, JR., *State Engineer and Surveyor :*

SIR — The New York Cable Towing Company now having over eighty miles of their cable laid on this division of the Erie canal, I beg leave to offer the following in regard to

### *Cable Towing.*

This company have during the past season extended their cable from Middleport to Rochester, so that, with the exception of twelve miles on Tonawanda creek, they have an uninterrupted cable from Buffalo to Rochester.

The company inform me that they have contracted for the rest of the cable from Rochester to Troy. That they have now ten (10) cable towing boats, which will be augmented to twenty-five (25) by the spring opening of navigation.

They calculate that to do the towing of the same number of boats now operating on the canal, will require at least fifty (50) more, which additional number will be constructed as soon as possible, and they will keep on constructing to keep apace with business.

They will tow with tug-boats through Tonawanda creek, as there the use of the cable is destroyed by existing snags and sunken logs. They consider the mechanical and practicable difficulties as sufficiently overcome to determine them upon laying the rest of the cable and constructing the boats; they will begin to tow the whole length of the canal with twenty-five boats in the spring, as soon after the opening of navigation as the rest of the cable can be laid, and are perfectly satisfied that they can offer to boatmen sufficient inducements to use their system of towing in preference to animal power.

They intend to charge twenty (20) cents per mile for towing a boat, which, with the advantages to be derived from a quicker trip, will prove to be much cheaper than horse-power; and, therefore, that self-interest will cause the boat-owners to patronize them.

They expect to tow in sections of about fifteen (15) miles, as most likely to produce the best results, preferring to do so, than run the cable towing boats longer distances.

A tow of eight boats can be taken along at an average speed of three (3) miles per hour in ordinary canal, more in deeper water, and that they can send the boats through at the rate of sixty (60) miles in twenty-four (24) hours, the first season, they confidently expect; and further, than when the hands engaged on the "cable towing boats" and the boatmen get used to the method, "when experience comes to their aid," better time can be made.

They ask a favorable consideration, "kind offices and good will," at the hands of both boatmen and canal officials.

From what I have seen of the performance of their boats, I am favorably impressed with the feasibility of their doing all that they promise, namely: the whole towing on the canal. There are to be sure some difficulties, but they mostly arise from inexperience and can be overcome; and what has been successfully accomplished on the rivers of Belgium can, I have no doubt, be accomplished by "Yankee ingenuity" on American canals.

The cable was laid to Rochester so late in the season that when ready to work only one trial trip could be made over the whole distance. The result is as follows:

"Log of Cable Towing." (Boats—"Our Harry," Gaines; "H. R. Roba," Mixer; "Geo. D. Gillson," Gillson; "W. T. Warner," Philbrick; "Perry Robinson," Cummings; and the "W. T. Knight," Barrett.)

Points on Canal.	Date.	Leave.	Arrive.	Time of towing.	Distance	Remarks.
	Nov. 1879.	A. M.	A. M.	h's mins.	Miles.	
Buffalo.....	17th	6.50	7.45	0 55	4	Strong wind, low water. One hour locking.
Black Rock.....	17th	8.45	.....	.....	..	
Black Rock.....	17th	.....	.....	.....	..	
Tonawanda.....	17th	.....	11.10	2 25	8	{ No cable in Tonawanda creek, 10 mins. transferring to tug, had to drop one boat the tug being overloaded.
Tonawanda.....	17th	11.20	.....	.....	..	
Pendleton.....	17th	.....	P. M. 4.50	5 30	12	One minute transferring to cable boat. 2 hours and 30 mins. locking
Pendleton.....	17th	4.51	.....	.....	..	
Lockport.....	17th	.....	6.30	1 30	7	
Lockport.....	17th	9.00	.....	.....	..	
Medina.....	18th	.....	A. M. 4.00	7 00	18	2 h. 30 mins. raising steam on cable boat.
Medina.....	18th	6.30	.....	.....	..	
Brockport.....	18th	.....	P. M. 8.45	9 00	24	15 mins. transferring from one cable boat to another. No accident or collision.
Brockport.....	18th	4.00	.....	.....	..	
Rochester.....	18th	.....	11.00	7 00	20	
Towing time.....				33 20	93, or	2.774 miles per hour.

	Hours.	Mins.
Whole time from Buffalo to Rochester .....	40	10
Less lockage and transfers .....	6	41
Towing time, including delays in passing boats.....	33	29

"The fastest time was four miles per hour; the slowest, two miles per hour, the boats in tow giving no trouble to us and having none themselves; high winds, snow and hail the whole distance; all the boats were deeply laden, two of them drawing something more than "six feet of water."

The time of the steamer "Emma and consort" for the same distance on a trial trip in July last was,

	Hours.	Min.
Whole time, Buffalo to Rochester.....	37	00
Less lockages and stops.....	3	59
	—	—
Running time.....	33	01
	==	==

The usual time taken for a loaded boat to pass over the same distance is 44 hours running time. So that both the "cable towing boat" and the "steamer and consort" show a saving of one-fourth on the time consumed by the horse-boat in going the same distance.

It is but fair to add that both the crews of the "cable towing boat" and the canal boats constituting the "fleet," were unused to the business, whereas that of the "steamer and consort" were thoroughly used to it; and I think that the result of the first trip of any length may be considered one of rather more than ordinary success as a first trip.

Mr. Miers Coryell, the constructing and mechanical engineer of the company, speaking of the engines and their work, says:

"We have adopted the ordinary simply constructed tug-boat engine having no condenser or expansive gear, using the steam without that economy practiced upon the better arranged engines of the canal steamers, and we probably waste thirty per cent of our fuel; our engines are, however, so constructed that these improvements can be readily placed upon them at a small expense."

"On our through trip from Buffalo to Rochester (November 17) we had to encounter shoal water as far as the guard-lock, Black Rock; owing to the direction of the wind up the lake, muddy water arose around each boat and we developed forty-two horse-power to do the work; from Pendleton to Rochester we used thirty horse-power only."

"To show the application of the cable towing power upon the boats in tow and to account for the economy of our system, I will state that the seven-eighths inch steel wire cable in use has a tensional strength of twenty tons within the limit of safety. At thirty-horse power, the traction on the cable is 3,536 pounds at a speed of two hundred and eighty (280) feet per minute, or  $3\frac{1}{10}$  miles per hour, showing an almost total absence of slip; using forty-five horse power the traction on the cable is 5,390 pounds, being the power necessary to tow eight loaded boats at the rate of three miles per hour.

"The consumption of fuel, eighty-seven (87) pounds per hour,

including that used to raise steam, is that which was used for an average speed of three (3) miles per hour, for a tow of five boats, and we estimated that less than 3,000 pounds per 24 hours will suffice for the towage of eight loaded boats at a speed of three (3) miles per hour or (72) seventy-two miles per day; however, for the first season we shall not probably realize more than (60) sixty miles per day."

The fact that in the above-mentioned experimental trip the "cable towing boat" has taken along a fleet of six (6) boats part of the way and five (5) boats all the way from Buffalo to Rochester, and has equaled the speed of the "steamer Emma and consort," a boat remarkably well officered and that with a consumption of only two pounds of coal per mile more, has impressed me with the thought that it would be well to give this subject of cable towing on the Erie canal publicity in the report of the State Engineer and Surveyor, more especially as the company themselves have sufficient faith in their project to order the rest of the cable and other outfit, coupled with the fact that in no case can it amount to a monopoly or tend to destroy the free navigation of the canal, a thing of paramount importance, as the boatmen if not well served can always return to the use of the horse for their towing.

If the time occupied in making a trip can thus be reduced, then the profit to the craft is thereby increased; this profit would always by competition be reduced and the gain by reason of the shortened trip shared in by both producer and consumer.

Respectfully submitted.

THOS. EVERSLED, *Division Engineer.*

[Assem. Doc. No. 88.]      18

## HUDSON RIVER IMPROVEMENT.

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ALBANY, Feb. 26, 1880.

HON. HORATIO SEYMOUR, JR., *State Engineer and Surveyor*:

SIR— I have the honor to make the following report of the work done on the Hudson river during the past season.

CHANDLEY L. PHELPS.

*Assistant Engineer in charge.*

### *Hudson River Improvement.*

During the past season there was removed from the Hudson river 114,197 cubic yards of material at the following points:

12,426 cubic yards at Mull's; 15,520 cubic yards at Round Shoals; 16,299 cubic yards at Burden's steel works; 25,678 cubic yards at fish-house bar; 40,067 cubic yards at Bogart's light; and 4,207 cubic yards at New Baltimore.

The plan adopted the year previous of advertising for proposals to do the work was continued, the contracts being let to the lowest bidder.

An engineer was in charge of each dredge, and an inspector was placed on the dumping ground to secure the proper deposit of the material removed, and to prevent the dropping or unloading of the scows in the channel.

The following statement shows the amount expended and the several items of expense paid contractors for dredging:

Burden's steel works.....	\$3,687 65	
Round Shoals.....	3,879 97	
Fish-house bar.....	6,419 50	
Mull's .....	1,491 12	
Bogart's light .....	6,010 05	
New Baltimore.....	420 70	
		\$21,908 99
Salary of assistant engineer in charge of work.....	936 00	
Salaries of inspectors.....	1,899 62	
Expenses of assistant engineer.....	15 56	
Expenses of inspectors.....	22 22	
Engineering expenses.....	290 94	
Use of tugs.....	72 00	
Advertising for proposals.....	39 50	
Argus Company, printing blanks.....	35 25	
Total .....		<u>\$25,220 08</u>

Balance on hand 1879.....	\$3,424 77	
Appropriation, chap. 106, Laws 1879....	30,000 00	
Total .....	<u>\$33,424 77</u>	
Expended season of 1879.....	<u>25,220 08</u>	
Available season of 1880.....		<u><u>\$8,204 69</u></u>

*Amount expended during the season of 1879, by the State Engineer and Surveyor (pursuant to chap. 106, Laws of 1879):*

Salary of assistant engineer in charge.....	\$936 00
Salaries of inspectors of dredging.....	1,899 62
Expenses of assistant engineer.....	15 56
Expenses of inspectors.....	22 22
Engineering expenses.....	290 94
Use of tugs.....	72 00
Advertising for proposals.....	39 50
Argus Co., printing blanks.....	35 25
Contractors for dredging.....	21,908 99
Total.....	<u><u>\$25,220 08</u></u>

*Number of cubic yards of material removed and price per cubic yard :*

Mull's.....	12,426 cubic yards at 12 cts....	\$1,491 12
Round Shoals.....	15,520 cubic yards at 25 cts....	3,879 97
Burden's steel works.....	16,299 cubic yards at 22½ cts....	3,687 65
Fish-house bar.....	25,678 cubic yards at 25 cts....	6,419 50
Bogart's light.....	40,067 cubic yards at 15 cts....	6,010 05
New Baltimore.....	4,207 cubic yards at 10 cts....	420 70
Total.....	<u>114,197</u>	<u><u>\$21,908 99</u></u>

*Memorandum showing amount of money available for season of 1880.*

Balance of appropriation of 1878.....	\$3,427 77
Appropriation, chap. 106, Laws 1879.....	30,000 00
	<u>\$33,424 77</u>
Amount expended 1879.....	<u>25,220 08</u>
Balance available in 1880.....	<u><u>\$8,204 69</u></u>





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STATE OF NEW YORK.

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No. 89.

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IN ASSEMBLY,

MARCH 15, 1880.

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ANNUAL REPORT

OF THE SAILORS' SNUG HARBOR IN THE CITY OF NEW  
YORK FOR THE YEAR 1879.

STATE OF NEW YORK:

EXECUTIVE CHAMBER,  
ALBANY, *March 15, 1880.* }

*To the Legislature:*

The annual report of the controller of the Sailors' Snug Harbor in the city of New York, for the year 1879, is herewith respectfully transmitted.

ALONZO B. CORNELL.

[Assem. Doc. No. 89.]

1

*To the Honorable, the Legislature of the State of New York:*

The *annual report of the controller of the "Sailors' Snug Harbor in the city of New York,"* showing the *receipts and disbursements* of the trust from the *1st day of January* to the *31st day of December, 1879, inclusive*; showing also the *present state of the funds* and an *estimate of the income* for the year 1880.

#### RECEIPTS.

Balance of cash on hand 31st of December, 1878.. . . .	\$76,149 61
Cash for sundries sold by Thos. Melville, governor at the institution, and for use of the harbor, dock, etc. . . . .	1,443 62
Cash for rents during the year. . . . .	279,666 52
Cash for interest on investments and temporary deposits in trust companies. . . . .	21,643 25
Cash on account of principal of bond. . . . .	5,000 00
	<hr/>
	\$383,903 00

#### DISBURSEMENTS.

Purchase of government bonds. . . . .	\$50,031 25
Deposit in trust company. . . . .	10,000 00
Cash paid for improvements and repairs. . . . .	169,537 36
Cash paid for expenses of the institution, including taxes and insurance. . . . .	130,508 62
Balance of cash 31st of December, 1879. . . . .	23,825 77
	<hr/>
	\$383,903 00

#### FUNDS.

Buildings obtained by purchase and foreclosure. . . . .	\$161,934 37
Loans on bond and mortgage. . . . .	68,000 00
United States bonds. . . . .	100,000 00
New York city bonds. . . . .	110,000 00
Brooklyn city bonds. . . . .	25,000 00
Temporary deposit in trust company. . . . .	50,000 00
Balance of cash 31st of December, 1879. . . . .	23,825 77
	<hr/>
	\$538,760 14

#### ESTIMATED INCOME FOR THE YEAR 1880.

Rents of lots and buildings. . . . .	\$290,602 50
Ground rents outstanding and estimated collectible. . . . .	13,787 07
Interest. . . . .	18,530 00
	<hr/>
	\$322,919 57

THOMAS GREENLEAF,  
*Controller.*

The executive committee of the board of trustees of the "Sailors' Snug Harbor in the city of New York," having attended to the duties assigned them pursuant to a standing order of the board, report

That they have carefully examined the controller's accounts from the 1st day of January to the 31st day of December, 1879, inclusive; that they have examined the vouchers for the disbursements; they have also examined the securities held by the trustees, and have found the same to be in all respects correct. And that there was a balance of cash in favor of the trustees of twenty-three thousand eight hundred and twenty-five and seventy-seven one hundredth dollars (\$23,825.77), and that the same was on deposit to the credit of the trustees, viz: \$18,398.27 in the Marine Bank, \$5,424.10 in the Manhattan Company, and \$3.40 balance of petty cash in the office.

Dated NEW YORK, *March 8*, 1880.

AMBROSE SNOW,  
WILLIAM M. PAXTON,  
E. G. TINKER,  
G. D. BABCOCK,

*Executive Committee of the Board of Trustees of the  
"Sailors' Snug Harbor in the city of New York."*





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